General Education/Core Curriculum Associations included in this report:

- **5 Freshman Composition** - SLO is related to writing instruction, citation formatting, conventions of academic writing, audience awareness, varied rhetorical strategies, collaboration, and/or revision with attention to purpose, development, style, grammar, punctuation and spelling
- **8 Mathematics** - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge
- **9 Computer** - SLO is related to building on prior computing knowledge or expanding existing knowledge through the development and analysis of computer applications within the discipline
- **10 Social and Behavioral Sciences** - SLO is related to human behavior, social structures or economics
- **11 History** - SLO is related to historical development and change over major periods of time and/or provides a survey of social, cultural, economic and political developments that have molded the modern world
- **12 Humanities** - SLO is related to students' ability to deal with questions of values, ethics, or aesthetics as they are represented in literature, philosophy, religion and the arts
- **13 Natural Science** - SLO is related to a hands-on laboratory or field experience that emphasizes the scientific method and analysis of data
- **14 Writing** - SLO is related to building on students' competency in academic writing skills and aims to extend those skills

### 5 Freshman Composition - SLO is related to writing instruction, citation formatting, conventions of academic writing, audience awareness, varied rhetorical strategies, collaboration, and/or revision with attention to purpose, development, style, grammar, punctuation and spelling (1 association)

**Electr & CompEngr B.S.E.E. (1)**

**O 10: ABET PROGRAM OUTCOME G**

(Skills/Abilities) Students shall demonstrate an ability to communicate effectively in oral, written, and graphical formats.

**MEASURES:** Graduates should be able to:

- G1. Describe the elements of a good technical report.
- G2. Describe the elements of an effective oral presentation.
- G3. Write an effective technical report in English.
- G4. Prepare and deliver an effective oral technical presentation.
- G5. Employ engineering graphics effectively in written presentations.

**Connected Document:**

[electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes](#)

**Related Measures**

**M 19: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME G)**

Direct assessment of student learning outcome (ABET PROGRAM OUTCOME G) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

**Source of Evidence:** Academic direct measure of learning - other

**Target:**

For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

**Findings (2012-2013) - Target: Met**

Assessments of PROGRAM OUTCOME G (with measures G1-G6) include 9 unique assessments across 5 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome G was 3.60/4.00 as compared to 3.59/4.00 in 2011-2012.

**Findings (2011-2012) - Target: Met**

Assessments of PROGRAM OUTCOME G (with measures G1-G6) include 9 unique assessments across 5 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome G was 3.60/4.00 as compared to 3.59/4.00 in 2010-2011.

**M 20: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME G)**

Indirect assessment of this student learning outcome will be made through exiting senior completion of the
Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
EBI questions 60 and 61 correspond to ABET Program Outcome G. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 2 questions was 5.61/7.00, exceeding our target of 5.00.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part G of ECE senior exit survey questions 27 addresses student ability to communicate effectively. These questions relate directly to ABET outcome G. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome G was 6.08/7.00.

8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge (8 associations)

Chemical Engineering B.S.Che.E (3)
O 4: Knowledge of math, engineering, and basic science (ABET a)
The ability to apply knowledge of mathematics and engineering and have a thorough grounding in the basic sciences including chemistry, physics and biology.

Connected Documents:
chemical engineering bachelors Curriculum Map I
chemical engineering bachelors Curriculum Map II

Related Measures

M 7: Skills Inventory test CHE 493/CHE 125
A quiz to test students general ability to apply knowledge of mathematics, science, and engineering to problems involving order of magnitude estimates, unit conversions, weight versus mass, and more. Results are compared for freshman students entering the program (CHE 125 introductory 1 hr course) to seniors who take the exam in CHE 493.

Source of Evidence: Faculty pre-test / post-test of knowledge mastery

Target:
For students completing the program (CHE 493) more than half should answer at least 19 out of the 24 questions correctly.

Findings (2011-2012) - Target: Met
For seniors (CHE 493) only four out of 24 questions had less than half of the students answer it correctly, while for freshmen only two of the 24 questions had less than 50% answering correctly.

M 8: Criterion based grading: basic sciences
Criterion Based Grading (CBG) in CH 101, 102, 231, 232, 237; PH 105, 106; and BSC 114 to assess grounding in the basic sciences of chemistry, physics and biology. CBG refers to “criterion based grading” by which attainment of an outcome is determined by the final grade assigned to a student in a course. Criterion based grading will be phased out and replaced by rubric type scoring of a special problem during the 2013-2019 ABET cycle.

Source of Evidence: Academic direct measure of learning - other

M 28: Six year graduate survey
Six-year surveys of graduates of the ChBE department

Source of Evidence: Alumni survey or tracking of alumni achievements

O 5: Laboratory skills (ABET b)
The ability to operate in a laboratory environment, specifically to design and conduct experiments as well as to analyze and interpret experimental data

Connected Documents:
chemical engineering bachelors Curriculum Map I
chemical engineering bachelors Curriculum Map II

Related Measures

M 9: CHE 319 experimental design exam with rubric
A Criterion Based Exam scored using a Rubric in CHE 319 to address ability to design and conduct experiments

Source of Evidence: Project, either individual or group
The ability of students to design an experiment has been evaluated using a rubric, and students all scored more than 80 out of 100 and thus the outcome was deemed "met". A better classroom is needed to assess more completely the ability to use modern tools of engineering. As of summer 2012, the facilities have been provided for presentations in the CHE 319 course. Based on the assessment that was completed, however, no other action is necessary.

**Findings** (2011-2012) - Target: Met
An excerpt of the attached documents (319_Fall 11 and 319 Spring 12) reporting the assessment findings are the following:

"I am satisfied with the results of the oral exam rubric testing the ABET outcome "an ability to design and conduct experiments." It is truly an evaluation of each individual student. However, a better method is with formal proposal presentations. This was impossible because a suitable classroom was not available. The second ABET outcome "a working knowledge of modern experimental techniques" was more difficult to test because it was difficult to distinguish individual contributions to the reports. The lack of a suitable classroom made it difficult to give written examinations to establish individual understanding of the techniques. Proposal presentations and written examinations will be once again possible if a suitable classroom can be provided. Since the instructor needs to meet with one section for lecture, proposals, and tests while a second section is actually in the lab conducting experiments, the classroom must be in close proximity. This past year all possible space was unavailable because of logistical difficulties resulting from construction. A large graduate student office will become available for Fall, 2012 across the hall from the lab. A proposal is in preparation to repurpose this room for this lab course and other specific uses."

**M 10: CHE 320 written communication rubric**
A rubric is used in CHE 320 to assess the ability to communicate effectively in writing the concepts of designed experiments, analyzed data, and interpretation of data. For example, written reports on heat transfer (and other equivalent topic), authored by individual students are scored using a Rubric in CHE 320 to address ability to analyze and interpret data from experiments designed by the students.

Source of Evidence: Writing exam to assure certain proficiency level

**M 11: CHE 320 oral communication rubric**
A rubric is used in CHE 320 to assess the ability to communicate effectively in speaking the concepts of designed experiments, analysis of data, and interpretation of data

Source of Evidence: Presentation, either individual or group

**M 19: CHE 320 data analysis writing assignment with rubric**
Written reports on heat transfer (or other equivalent topic), authored by individual students are scored using a Rubric in CHE 320 to address ability to analyze and interpret data

Source of Evidence: Written assignment(s), usually scored by a rubric

**M 28: Six year graduate survey**
Six-year surveys of graduates of the ChBE department

Source of Evidence: Alumni survey or tracking of alumni achievements

**M 37: **********
Senior exit interviews conducted during the graduate luncheon by the advisory board or the department head

Source of Evidence: Exit interviews with grads/program completers

**O 6: Design physical, chemical, and biological processes (ABET c)**
The content knowledge to design physical, chemical, and biological processes to meet desired needs within realistic economic, health, and safety constraints.

**Connected Documents:**
- chemical engineering bachelors Curriculum Map I
- chemical engineering bachelors Curriculum Map II

**Related Measures**

**M 3: Advisory Board Questionnaire**
Advisory Board members meet with graduating students and assess student quality, student learning objective, and the program's educational objectives. The questionnaire contains two pages. One page is for the members to discuss the appropriateness of each learning objective with the student. Typical questions are: Are our objectives appropriate? Do we need to add, delete or modify any objectives? Feedback may be positive or negative. The second page is for the members to assess the senior's ability to communicate the principles of chemical engineering as they relate to knowledge of design of processes.

Source of Evidence: Advisory board or community feedback on program

**M 12: CHE 481 design rubric**
A rubric, applied in CHE 481, assesses the knowledge of chemical engineering principles as they are used to design of physical, chemical, and biological processes within realistic economic, health and safety constraints.

Source of Evidence: Project, either individual or group

**M 13: CHE 482 design problems**
Individual and team projects are assessed using a rubric to measure the concept knowledge of chemical engineering principles in the design of physical, chemical, and biological processes with a state-of-the-art a chemical process simulator based on concept knowledge of chemical and biological engineering principles.

Source of Evidence: Project, either individual or group

**M 16:**********
Senior exit interviews conducted during the graduate luncheon by the advisory board or the department head 9

Source of Evidence: Exit interviews with grads/program completers

**M 28: Six year graduate survey**
Six-year surveys of graduates of the ChBE department

Source of Evidence: Alumni survey or tracking of alumni achievements

**Electr & CompEngr B.S.E.E. (4)**

**O 4: ABET PROGRAM OUTCOME A**
(Discipline Knowledge) Students shall demonstrate an ability to apply knowledge of mathematics, science, and engineering necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to Program Educational Objectives.

**MEASURES:** Graduates should be able to:

A1. Apply knowledge of linear electrical circuit analysis, including basic concepts of voltage, current, power, resistance, capacitance, and inductance; circuit reduction techniques; nodal and mesh analysis; superposition; complex phasors; and differential equations.

A2. Apply knowledge of linear electrical network analysis, including transient behavior using differential equations, integration for Laplace transform analysis, complex mathematics for integral transforms, networks in terms of equivalent circuits, and asymptotic response estimates for Bode plots.

A3. Apply knowledge of signal analysis and systems theory, including integration for time-domain convolution and Fourier analysis, complex mathematics for integral transforms (Fourier and Z), approximation of continuous-time spectra, decomposition of complicated signals into simple spectral components, and convergence properties of some Fourier series.

A4. Analyze and design diode, single-stage transistor, and operational-amplifier circuits, including dc and small-signal operation, and elementary applications.

A5. Analyze and design multi-stage transistor and operational-amplifier circuits, including dc and small-signal operation, frequency response, feedback topologies, stability, large-signal operation, and digital applications.

A6. (EE only) Demonstrate knowledge of electromagnetic principles, including electromagnetic fields and waves, propagation and radiation, and applied three-dimensional vector analysis.

A7. (EE only) Demonstrate knowledge of electromechanics and power principles, including three-phase circuits, magnetic circuits, transformers, dc and ac machines, and power transmission lines.

A8. Analyze and design logic networks using both traditional techniques (such as K-maps and state tables) and modern CAD tools.

A9. Demonstrate a fundamental knowledge of microprocessors, assembly-language programming, microcomputer systems, and hardware interfaces.

**Connected Document:**
[electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes](#)

**Related Measures**

**M 7: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME A)**
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME A) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

**Target:**
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

**Findings (2012-2013) - Target: Met**
Assessments of PROGRAM OUTCOME A (with measures A1-A9) include 11 unique assessments across 11 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome A was 3.36/4.00 as compared to 3.26/4.00 in 2011-2012. The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

**Findings (2011-2012) - Target: Met**
Assessments of PROGRAM OUTCOME A (with measures A1-A9) include 11 unique assessments across 11 course offerings including courses as shown in the attached course embedded assessment
curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome A was 3.31/4.00 as compared to 3.36/4.00 in 2010-2011. The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

The assessment for one measure (A7) was 2.75/4.00. The instructor notes that assessment of skill A7 is significantly below the desired threshold of 3.0. It appears from student work, that extrapolating sinusoidal steady-state circuit concepts to three-phase power problems is the primary issue.

Corrective Action: Currently, a non-trivial amount of class time is spent reviewing sinusoidal steady-state circuit concepts. In future terms, the review will be accomplished with out of class assignments, and more lecture time will be devoted to three-phase concepts. Also, ECE 225 (Circuits) instructors will be encouraged to focus on the primary concepts of sinusoidal steady-state analysis. Finally, more practice problems will be made available.

M 8: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME A)
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
EBI questions 47, 48, and 49 correspond to ABET Program Outcome A. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 3 questions was 6.20/7.00, exceeding our target of 5.00.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part A of ECE senior exit survey questions 27 addresses student ability to apply knowledge of engineering, mathematics, and science. These questions relate directly to ABET outcome A. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome A was 5.93/7.00.

O 14: ABET PROGRAM OUTCOME K
(Skills/Abilities) Students shall demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

MEASURES: Graduates should be able to:

K1. Recognize the need to use modern tools to assist solving problems.

K2. Find up-to-date engineering tools or existing solutions using classical and modern search techniques (library, Web, etc.).

K3. Identify and apply appropriate modern technologies to an assigned task.

K4. Use modern CAD, analysis, and simulation software.

Connected Document: electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes

Related Measures

M 27: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME K)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME K) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME K (with measures K1-K4) include 5 unique assessments across 4 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome K was 3.62/4.00 as compared to 3.72/4.00 in 2011-2012.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME K (with measures K1-K6) include 7 unique assessments across 5 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2010-2011 show that overall student performance for Program Outcome K was 3.76/4.00 as compared to 3.59/4.00 in 2010-2011.
M 28: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME K)

Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
EBI question 64 corresponds to ABET Program Outcome K. The 2011-2012 EBI data is used for 2012-2013 assessment, and the score on this question was 5.67/7.00, exceeding our target of 5.00.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part K of ECE senior exit survey questions 27 addresses student ability to use techniques, skills, and modern engineering tools necessary for engineering practice. These questions relate directly to ABET outcome K. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome K was 5.96/7.00.

O 15: ABET PROGRAM SPECIFIC CRITERIA FOR ECE (PROGRAM OUTCOME L)
(Discipline Knowledge) Students shall demonstrate knowledge of probability and statistics, specifically applied to problems in electrical or computer engineering.

MEASURES: Graduates should be able to demonstrate:

L1. Knowledge of probability and statistics.

L2. An ability to apply probability and statistics to model uncertainty and data behavior.

Connected Document: electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes

Related Measures

M 29: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME L)

Direct assessment of student learning outcome (ABET PROGRAM OUTCOME L) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME L (with measures L1-L2) include 2 unique assessments across 1 course offering including courses as shown in the course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome L was 3.74/4.00 as compared to 3.50/4.00 in 2011-2012. The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME L (with measures L1-L2) include 2 unique assessments across 1 course offering including courses as shown in the course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome L was 3.50/4.00 as compared to 3.49/4.00 in 2010-2011.

The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

M 30: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME L)

Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Not Met
Senior exit survey responses on the question corresponding to this outcome averaged 3.60, which falls
Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student’s opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part L of ECE senior exit survey questions 27 addresses student knowledge of probability and statistics, including applications to electrical or computer engineering. These questions relate directly to ABET outcome L. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome L was 5.35/7.00.

M 31: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME M)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME M) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME M (with measures M1-M4) include 8 unique assessments across 4 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome M was 3.45/4.00 as compared to 3.34/4.00 in 2011-2012. The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME M (with measures M1-M2) include 7 unique assessments across 4 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome M was 3.44/4.00 as compared to 3.65/4.00 in 2010-2011.

The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

O 16: ABET PROGRAM SPECIFIC CRITERIA FOR ECE (PROGRAM OUTCOME M)
(Discipline Knowledge) Students shall demonstrate knowledge of advanced mathematics, typically including differential equations, linear algebra, and complex variables; and also for graduates with the computer engineering option, knowledge of discrete mathematics.

MEASURES: Electrical engineering graduates should be able to demonstrate:

M2. Understanding of complex algebra and variables.
M3. Understanding linear algebra and matrix methods.
M4. Understanding of discrete mathematics.

Related Measures

M 31: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME M)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME M) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic indirect indicator of learning - other

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME M (with measures M1-M2) include 7 unique assessments across 4 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome M was 3.44/4.00 as compared to 3.65/4.00 in 2010-2011.

The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

M 32: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME M)
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers
Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
Senior exit surveys responses on the question corresponding to this outcome averaged 4.30, which meets the target of 4.0/5.0.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student’s opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part M of ECE senior exit survey question 27 addresses student knowledge of advanced mathematics, typically including differential equations, linear algebra, and complex variables; and, for computer engineering, discrete mathematics. These questions relate directly to ABET outcome M. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome M was 5.89/7.00.

Mechanical Engineering B.S.M.E. (1)
O 1: Knowledge of Math, Sci, Eng
(Discipline Knowledge) An ability to apply knowledge of mathematics, science, and engineering

Connected Documents:
Mechanical engineering bachelors Curriculum Map I
Mechanical engineering bachelors Curriculum Map II

Related Measures

M 1: FE Math, Sci, Eng, morning pass rate
Achieve a pass rate of greater than 85% of the national average on the morning portion of the Fundamentals of Engineering Exam.

Source of Evidence: Academic direct measure of learning - other
Target:
Pass rate > 85% of national average

Findings (2012-2013) - Target: Met
Pass rate was 110% of national average

Findings (2011-2012) - Target: Met
Pass rate was 99.7% of the national average. Target was met.

M 2: Co-op Survey Math, Sci, Eng
Achieve average scores on questions 14, 15, and 16 of the Co-op Employer Survey of greater than 1.9/3.0.

Source of Evidence: Academic direct measure of learning - other
Target:
Average scores > 1.9/3.0

Findings (2012-2013) - Target: Met
Score was 2.11/3.00

Findings (2011-2012) - Target: Met
Score was 2.24/3.0. Target was met.

M 3: ME 489 rubric apply ME knowledge
Achieve average scores on item “a” of the ME 489 assessment rubric greater than 7/10.

Source of Evidence: Academic direct measure of learning - other
Target:
score on item a > 7

Findings (2012-2013) - Target: Met
Score was 8.70

Findings (2011-2012) - Target: Met
Score was 8.6/9.0. Target was met.

M 4: ME 490 rubric apply ME knowledge
Achieve average scores on item “a” of the ME 490 assessment rubric greater than 3/5.

Source of Evidence: Faculty pre-test / post-test of knowledge mastery
Target:
Score in Item a > 3/5

Findings (2012-2013) - Target: Met
Score was 4.32

Findings (2011-2012) - Target: Met
Score was 4.1/5. Target was met.
Electr & CompEngr B.S.E.E. (1)

O 14: ABET PROGRAM OUTCOME K
(Skills/Abilities) Students shall demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

MEASURES: Graduates should be able to:

K1. Recognize the need to use modern tools to assist solving problems.

K2. Find up-to-date engineering tools or existing solutions using classical and modern search techniques (library, Web, etc.).

K3. Identify and apply appropriate modern technologies to an assigned task.

K4. Use modern CAD, analysis, and simulation software.

Connected Document: electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes

Related Measures

M 27: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME K)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME K) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME K (with measures K1-K4) include 5 unique assessments across 4 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome K was 3.62/4.00 as compared to 3.72/4.00 in 2011-2012.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME K (with measures K1-K6) include 7 unique assessments across 5 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2010-2011 show that overall student performance for Program Outcome K was 3.76/4.00 as compared to 3.59/4.00 in 2010-2011.

M 28: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME K)
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
EBI question 64 corresponds to ABET Program Outcome K. The 2011-2012 EBI data is used for 2012-2013 assessment, and the score on this question was 5.67/7.00, exceeding our target of 5.00.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part K of ECE senior exit survey questions 27 addresses student ability to use techniques, skills, and modern engineering tools necessary for engineering practice. These questions relate directly to ABET outcome K. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome K was 5.96/7.00.
Mechanical engineering bachelors Curriculum Map II

Related Measures

M 28: Co-op Survey modern skills and tools
Achieve average scores on question 23 of the Co-op Employer Survey of greater than 1.9/3.0.
Source of Evidence: Academic direct measure of learning - other

Target:
>1.9/3

Findings (2012-2013) - Target: Met
Score of 2.14/3

Findings (2011-2012) - Target: Met
Score was 2.43/3. Target was met.

M 29: ME 489 modern skills and tools
Achieve average scores on item “k” of the ME 489 assessment rubric greater than 7/10.
Source of Evidence: Academic direct measure of learning - other

Target:
>7/10

Findings (2012-2013) - Target: Met
Score of 9.84/10

Findings (2011-2012) - Target: Met
Score was 8.8/10. Target was met.

M 30: ME 490 modern skills and tools
Achieve average scores on item “k” of the ME 490 assessment rubric greater than 3/5.
Source of Evidence: Academic direct measure of learning - other

Target:
>3/5

Findings (2012-2013) - Target: Met
Score of 4.2/5

Findings (2011-2012) - Target: Met
Score was 4.23/5. Target was met.

10 Social and Behavioral Sciences - SLO is related to human behavior, social structures or economics (2 associations)

Electr & CompEngr B.S.E.E. (1)

O 11: ABET PROGRAM OUTCOME H
(Discipline Knowledge) Students shall demonstrate an understanding of the broad education necessary to understand the impact of electrical or computer engineering solutions in a global, societal, and environmental context consistent with the principles of sustainable development.

MEASURES: Graduates should be able to:

H1. Create a list of questions concerning global, societal, and environmental impact of particular electrical or computer engineering implementations.

H2. Prepare an oral or written report referencing external sources concerning global, societal, and environmental impact of a specific engineering implementation.

Connected Document: electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes

Related Measures

M 21: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME H)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME H) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME H (with measures H1-H2) include 6 unique assessments across 3 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome H was 3.53/4.00 as compared to 3.69/4.00 in 2011-2012.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME H (with measures H1-H2) include 6 unique assessments across 3 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome
H was 3.83/4.00 as compared to 3.53/4.00 in 2010-2011.

**M 22: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME H)**

Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

**Connected Document:**

2011-2012 ECE Senior Exit Survey

**Target:**

An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

**Findings (2012-2013) - Target: Met**

EBI questions 71-73 correspond to ABET Program Outcome H. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 3 questions was 5.59/7.00, exceeding our target of 5.00.

**Findings (2011-2012) - Target: Met**

EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part H of ECE senior exit survey questions 27 addresses student understanding of the impact of engineering solutions in a broad global/societal context. These questions relate directly to ABET outcome H. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome H was 5.89/7.00.

**Mechanical Engineering B.S.M.E. (1)**

**O 8: Global and societal context**

The broad education necessary to understand the impact of engineering solutions in a global and societal context

**Connected Documents:**

Mechanical engineering bachelors Curriculum Map I
Mechanical engineering bachelors Curriculum Map II

**Related Measures**

**M 22: Senior Exit global and societal**

Average scores of 3.5/5 on question 15 of the department Senior Exit Survey

Source of Evidence: Academic direct measure of learning - other

**Target:**

>3.5/5

**Findings (2012-2013) - Target: Met**

Score of 4/5

**Findings (2011-2012) - Target: Met**

Score was 4.15/5. Target was met.

**M 23: ME 490 global and societal**

Achieve average scores on item “h” of the ME 490 assessment rubric greater than 3/5

Source of Evidence: Academic direct measure of learning - other

**Target:**

>3/5

**Findings (2012-2013) - Target: Met**

Score of 4.2/5

**Findings (2011-2012) - Target: Met**

Score was 4.13/5. Target was met.

**11 History - SLO is related to historical development and change over major periods of time and/or provides a survey of social, cultural, economic and political developments that have molded the modern world (1 association)**

Electr & CompEngr B.S.E.E. (1)

**O 11: ABET PROGRAM OUTCOME H**

(Discipline Knowledge) Students shall demonstrate an understanding of the broad education necessary to understand the impact of electrical or computer engineering solutions in a global, societal, and environmental context consistent with the principles of sustainable development.

**MEASURES:** Graduates should be able to:

H1. Create a list of questions concerning global, societal, and environmental impact of particular electrical or computer engineering implementations.

H2. Prepare an oral or written report referencing external sources concerning global, societal, and environmental impact of
a specific engineering implementation.

Connected Document:

electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes

Related Measures

M 21: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME H)

Direct assessment of student learning outcome (ABET PROGRAM OUTCOME H) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME H (with measures H1-H2) include 6 unique assessments across 3 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome H was 3.53/4.00 as compared to 3.69/4.00 in 2011-2012.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME H (with measures H1-H2) include 6 unique assessments across 3 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome H was 3.83/4.00 as compared to 3.53/4.00 in 2010-2011.

M 22: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME H)

Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
EBI questions 71-73 correspond to ABET Program Outcome H. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 3 questions was 5.59/7.00, exceeding our target of 5.00.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part H of ECE senior exit survey questions 27 addresses student understanding of the impact of engineering solutions in a broad global/societal context. These questions relate directly to ABET outcome H. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome H was 5.89/7.00.
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME F) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME F (with measures F1-F4) include 10 unique assessments across 6 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome F was 3.86/4.00 as compared to 3.66/4.00 in 2011-2012.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME F (with measures F1-F4) include 10 unique assessments across 6 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome F was 3.66/4.00 as compared to 3.54/4.00 in 2010-2011.

Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME F)
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
EBI questions 58 and 59 correspond to ABET Program Outcome F. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 2 questions was 6.17/7.00, exceeding our target of 5.00.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part F of ECE senior exit survey questions 27 addresses student understanding of professional and ethical responsibility. These questions relate directly to ABET outcome F. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome F was 6.34/7.00.

13 Natural Science - SLO is related to a hands-on laboratory or field experience that emphasizes the scientific method and analysis of data (6 associations)

Chemical Engineering B.S.Che.E (1)

O 4: Knowledge of math, engineering, and basic science (ABET a)
The ability to apply knowledge of mathematics and engineering and have a thorough grounding in the basic sciences including chemistry, physics and biology.

Connected Documents:
- chemical engineering bachelors Curriculum Map I
- chemical engineering bachelors Curriculum Map II

Related Measures

M 7: Skills Inventory test CHE 493/CHE 125
A quiz to test students general ability to apply knowledge of mathematics, science, and engineering to problems involving order of magnitude estimates, unit conversions, weight versus mass, and more. Results are compared for freshman students entering the program (CHE 125 introductory 1 hr course) to seniors who take the exam in CHE 493.

Source of Evidence: Faculty pre-test / post-test of knowledge mastery

Target:
For students completing the program (CHE 493) more than half should answer at least 19 out of the 24 questions correctly.

Findings (2011-2012) - Target: Met
For seniors (CHE 493) only four out of 24 questions had less than half of the students answer it correctly, while for freshmen only two of the 24 questions had less than 50% answering correctly.

M 8: Criterion based grading: basic sciences
Criterion Based Grading (CBG) in CH 101, 102, 231, 232, 237; PH 105, 106; and BSC 114 to assess grounding in
the basic sciences of chemistry, physics and biology. CBG refers to “criterion based grading” by which attainment of an outcome is determined by the final grade assigned to a student in a course. Criterion based grading will be phased out and replaced by rubric type scoring of a special problem during the 2013-2019 ABET cycle.

Source of Evidence: Academic direct measure of learning - other

M 28: Six year graduate survey
Six-year surveys of graduates of the ChBE department
Source of Evidence: Alumni survey or tracking of alumni achievements

Electr & CompEngr B.S.E.E. (3)

O 4: ABET PROGRAM OUTCOME A
(Discipline Knowledge) Students shall demonstrate an ability to apply knowledge of mathematics, science, and engineering necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to Program Educational Objectives.

MEASURES: Graduates should be able to:

A1. Apply knowledge of linear electrical circuit analysis, including basic concepts of voltage, current, power, resistance, capacitance, and inductance; circuit reduction techniques; nodal and mesh analysis; superposition; complex phasors; and differential equations.

A2. Apply knowledge of linear electrical network analysis, including transient behavior using differential equations, integration for Laplace transform analysis, complex mathematics for integral transforms, networks in terms of equivalent circuits, and asymptotic response estimates for Bode plots.

A3. Apply knowledge of signal analysis and systems theory, including integration for time-domain convolution and Fourier analysis, complex mathematics for integral transforms (Fourier and Z), approximation of continuous-time spectra, decomposition of complicated signals into simple spectral components, and convergence properties of some Fourier series.

A4. Analyze and design diode, single-stage transistor, and operational-amplifier circuits, including dc and small-signal operation, and elementary applications.

A5. Analyze and design multi-stage transistor and operational-amplifier circuits, including dc and small-signal operation, frequency response, feedback topologies, stability, large-signal operation, and digital applications.

A6. (EE only) Demonstrate knowledge of electromagnetic principles, including electromagnetic fields and waves, propagation and radiation, and applied three-dimensional vector analysis.

A7. (EE only) Demonstrate knowledge of electromechanics and power principles, including three-phase circuits, magnetic circuits, transformers, dc and ac machines, and power transmission lines.

A8. Analyze and design logic networks using both traditional techniques (such as K-maps and state tables) and modern CAD tools.

A9. Demonstrate a fundamental knowledge of microprocessors, assembly-language programming, microcomputer systems, and hardware interfaces.

Related Measures

M 7: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME A)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME A) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME A (with measures A1-A9) include 11 unique assessments across 11 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome A was 3.36/4.00 as compared to 3.26/4.00 in 2011-2012. The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME A (with measures A1-A9) include 11 unique assessments across 11 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome A was 3.31/4.00 as compared to 3.36/4.00 in 2010-2011. The target for this assessment was met. No substantial changes in course instruction or assessment are anticipated for the upcoming reporting cycle.

The assessment for one measure (A7) was 2.75/4.00. The instructor notes that assessment of skill A7 is significantly below the desired threshold of 3.0. It appears from student work, that extrapolating sinusoidal steady-state circuit concepts to three-phase power problems is the primary issue.
Corrective Action: Currently, a non-trivial amount of class time is spent reviewing sinusoidal steady-state circuit concepts. In future terms, the review will be accomplished with out of class assignments, and more lecture time will be devoted to three-phase concepts. Also, ECE 225 (Circuits) instructors will be encouraged to focus on the primary concepts of sinusoidal steady-state analysis. Finally, more practice problems will be made available.

M 8: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME A)
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

Connected Document: 2011-2012 ECE Senior Exit Survey

Target:
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

Findings (2012-2013) - Target: Met
EBI questions 47, 48, and 49 correspond to ABET Program Outcome A. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 3 questions was 6.20/7.00, exceeding our target of 5.00.

Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part A of ECE senior exit survey questions 27 addresses student ability to apply knowledge of engineering, mathematics, and science. These questions relate directly to ABET outcome A. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome A was 5.93/7.00.

O 5: ABET PROGRAM OUTCOME B
(Skills/Abilities) Students shall demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.

MEASURES: Graduates should be able to:

B1. Define a test procedure (including objectives and equipment set-up) to measure the characteristics of an electronic device or circuit (analog or digital).

B2. Discuss the operation of standard lab equipment, define the terminology used to define specification, indicate typical specification values for standard lab equipment.

B3. Configure, operate, and debug an experimental set-up using standard lab equipment.

B4. Discuss lab safety.

B5. Analyze and interpret data using statistical and model fitting approaches.

Connected Document: electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes

Related Measures

M 9: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME B)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME B) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

Target:
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

Findings (2012-2013) - Target: Met
Assessments of PROGRAM OUTCOME B (with measures B1-B5) include 9 unique assessments across 6 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome B was 3.56/4.00 as compared to 3.60/4.00 in 2011-2012. The assessment for one measure (B2) in one course was 2.91/4.00. However, modifications proposed in the 2011-2012 findings have been implemented, and in the Spring 2013 semester, B2 was assessed with a score of 3.05.

Findings (2011-2012) - Target: Met
Assessments of PROGRAM OUTCOME B (with measures B1-B5) include 9 unique assessments across 6 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome B was 3.64/4.00 as compared to 3.71/4.00 in 2010-2011.

The assessment for one measure (B2) in one course was 2.04/4.00. The instructor recommends that additional instruction (and assessments) will be performed in the laboratory to address the B2 outcome. Laboratory quizzes will be considered as the potential assessment mechanism.

M 10: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME B)
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

**Source of Evidence:** Benchmarking of learning outcomes against peers

**Connected Document:**
2011-2012 ECE Senior Exit Survey

**Target:**
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

**Findings (2012-2013) - Target: Met**
EBI questions 50, 51, and 52 correspond to ABET Program Outcome B. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 3 questions was 6.11/7.00, exceeding our target of 5.00.

**Findings (2011-2012) - Target: Met**
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part B of ECE senior exit survey questions 27 addresses student ability to design experiments, conduct experiments, and analyze and interpret data. These questions relate directly to ABET outcome B. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome B was 5.93/7.00.

**O 14: ABET PROGRAM OUTCOME K**
(Skills/Abilities) Students shall demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**MEASURES:** Graduates should be able to:

K1. Recognize the need to use modern tools to assist solving problems.

K2. Find up-to-date engineering tools or existing solutions using classical and modern search techniques (library, Web, etc.).

K3. Identify and apply appropriate modern technologies to an assigned task.

K4. Use modern CAD, analysis, and simulation software.

**Connected Document:**
electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes

**Related Measures**

**M 27: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME K)**
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME K) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

**Source of Evidence:** Academic direct measure of learning - other

**Target:**
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

**Findings (2012-2013) - Target: Met**
Assessments of PROGRAM OUTCOME K (with measures K1-K4) include 5 unique assessments across 4 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome K was 3.62/4.00 as compared to 3.72/4.00 in 2011-2012.

**Findings (2011-2012) - Target: Met**
Assessments of PROGRAM OUTCOME K (with measures K1-K6) include 7 unique assessments across 5 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2010-2011 show that overall student performance for Program Outcome K was 3.76/4.00 as compared to 3.59/4.00 in 2010-2011.

**M 28: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME K)**
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

**Source of Evidence:** Benchmarking of learning outcomes against peers

**Connected Document:**
2011-2012 ECE Senior Exit Survey

**Target:**
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

**Findings (2012-2013) - Target: Met**
EBI question 64 corresponds to ABET Program Outcome K. The 2011-2012 EBI data is used for 2012-2013 assessment, and the score on this question was 5.67/7.00, exceeding our target of 5.00.
Findings (2011-2012) - Target: Met

EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student's opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part K of ECE senior exit survey questions 27 addresses student ability to use techniques, skills, and modern engineering tools necessary for engineering practice. These questions relate directly to ABET outcome K. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome K was 5.96/7.00.

Mechanical Engineering B.S.M.E. (2)

O 1: Knowledge of Math, Sci, Eng

(Discipline Knowledge) An ability to apply knowledge of mathematics, science, and engineering

Connected Documents:
- Mechanical engineering bachelors Curriculum Map I
- Mechanical engineering bachelors Curriculum Map II

Related Measures

M 1: FE Math, Sci, Eng, morning pass rate
Achieve a pass rate of greater than 85% of the national average on the morning portion of the Fundamentals of Engineering Exam.

Source of Evidence: Academic direct measure of learning - other

Target:
Pass rate > 85% of national average

Findings (2012-2013) - Target: Met
Pass rate was 110% of national average

Findings (2011-2012) - Target: Met
Pass rate was 99.7% of the national average. Target was met.

M 2: Co-op Survey Math, Sci, Eng
Achieve average scores on questions 14, 15, and 16 of the Co-op Employer Survey of greater than 1.9/3.0.

Source of Evidence: Academic direct measure of learning - other

Target:
Average scores > 1.9/3.0

Findings (2012-2013) - Target: Met
Score was 2.11/3.00

Findings (2011-2012) - Target: Met
Score was 2.24/3.0. Target was met.

M 3: ME 489 rubric apply ME knowledge
Achieve average scores on item “a” of the ME 489 assessment rubric greater than 7/10.

Source of Evidence: Academic direct measure of learning - other

Target:
score on item a > 7

Findings (2012-2013) - Target: Met
Score was 8.70

Findings (2011-2012) - Target: Met
Score was 8.6/9.0. Target was met.

M 4: ME 490 rubric apply ME knowledge
Achieve average scores on item “a” of the ME 490 assessment rubric greater than 3/5.

Source of Evidence: Faculty pre-test / post-test of knowledge mastery

Target:
Score in Item a > 3/5

Findings (2012-2013) - Target: Met
Score was 4.32

Findings (2011-2012) - Target: Met
Score was 4.1/5. Target was met.

O 2: Experimental ability

(Skills/Abilities) An ability to design and conduct experiments, as well as to analyze and interpret data

Connected Documents:
- Mechanical engineering bachelors Curriculum Map I
- Mechanical engineering bachelors Curriculum Map II

Related Measures

M 5: Co-op Survey experiments
Achieve average scores on questions 20 and 21 of the Co-op Employer Survey of greater than 1.9/3.0.
### Source of Evidence: Academic direct measure of learning - other

**Target:** Average of questions 20 and 21 > 1.9/3

**Findings (2012-2013) - Target: Met**
Score was 2.13/3.0

**Findings (2011-2012) - Target: Met**
Score 2.24/3. Target was met.

### M 6: Student work in ME 360 and 460

Achieve average scores greater than 2/3 by department assessment committee of student work in the laboratory courses ME 360 and ME 460

**Source of Evidence:** Academic direct measure of learning - other

**Target:** assessment committee score of > 2/3

**Findings (2012-2013) - Target: Met**
Score for ME 360 was 2.7/3 and for ME 460 was 2.7/3

**Findings (2011-2012) - Target: Met**
Score for ME 360 was 2.7/3.0; score for ME 460 was 2.7/3.0. Target was fully met.

### M 9: CHE 319 experimental design exam with rubric

A Criterion Based Exam scored using a Rubric in CHE 319 to address ability to design and conduct experiments

**Source of Evidence:** Project, either individual or group

**Target:**
The ability of students to design an experiment has been evaluated using a rubric, and students all scored more than 80 out of 100 and thus the outcome was deemed "met". A better classroom is needed to assess more completely the ability to use modern tools of engineering. As of summer 2012, the facilities have been provided for presentations in the CHE 319 course. Based on the assessment that was completed, however, no other action is necessary.

**Findings (2011-2012) - Target: Met**
An excerpt of the attached documents (319_Fall 11 and 319 Spring 12) reporting the assessment findings are the following:

"I am satisfied with the results of the oral exam rubric testing the ABET outcome "an ability to design and conduct experiments." It is truly an evaluation of each individual student. However, a better method is with formal proposal presentations. This was impossible because a suitable classroom was not available. The second ABET outcome "a working knowledge of modern experimental techniques" was more difficult to test because it was difficult to distinguish individual contributions to the reports. The lack of a suitable classroom made it difficult to give written examinations to establish individual understanding of the techniques. Proposal presentations and written examinations will be once again possible if a suitable classroom can be provided. Since the instructor needs to meet with one section for lecture, proposals, and tests while a second section is actually in the lab conducting experiments, the classroom must be in close proximity. This past year all possible space was unavailable because of logistical difficulties resulting from construction. A large graduate student office will become available for Fall, 2012 across the hall from the lab. A proposal is in preparation to repurpose this room for this lab course and other specific uses."

### M 10: CHE 320 written communication rubric

A rubric is used in CHE 320 to assess the ability to communicate effectively in writing the concepts of designed experiments, analyzed data, and interpretation of data. For example, written reports on heat transfer (and other equivalent topic), authored by individual students are scored using a Rubric in CHE 320 to address ability to analyze and interpret data from experiments designed by the students.
Source of Evidence: Writing exam to assure certain proficiency level

**M 11: CHE 320 oral communication rubric**
A rubric is used in CHE 320 to assess the ability to communicate effectively in speaking the concepts of designed experiments, analysis of data, and interpretation of data

Source of Evidence: Presentation, either individual or group

**M 19: CHE 320 data analysis writing assignment with rubric**
Written reports on heat transfer (or other equivalent topic), authored by individual students are scored using a Rubric in CHE 320 to address ability to analyze and interpret data

Source of Evidence: Written assignment(s), usually scored by a rubric

**M 28: Six year graduate survey**
Six-year surveys of graduates of the ChBE department

Source of Evidence: Alumni survey or tracking of alumni achievements

**M 37: Senior exit interviews**
Senior exit interviews conducted during the graduate luncheon by the advisory board or the department head

Source of Evidence: Exit interviews with grads/program completers

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**Electr & CompEngr B.S.E.E. (1)**

**O 10: ABET PROGRAM OUTCOME G**
(Skills/Abilities) Students shall demonstrate an ability to communicate effectively in oral, written, and graphical formats.

**MEASURES:** Graduates should be able to:

- G1. Describe the elements of a good technical report.
- G2. Describe the elements of an effective oral presentation.
- G3. Write an effective technical report in English.
- G4. Prepare and deliver an effective oral technical presentation.
- G5. Employ engineering graphics effectively in written presentations.

**Connected Document:**
- [electrical engineering bachelors Supporting Materials for Undergraduate Student Learning Outcomes](#)

**Related Measures**

**M 19: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME G)**
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME G) will be made through multiple course embedded assessments as indicated on the ECE curriculum map.

Source of Evidence: Academic direct measure of learning - other

**Target:**
For students passing the courses with embedded assessments for this outcome, the department average for these assessments will be 3.0/4.0 or above using a department standard assessment rubric.

**Findings (2012-2013) - Target: Met**
Assessments of PROGRAM OUTCOME G (with measures G1-G6) include 9 unique assessments across 5 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2012-2013 show that overall student performance for Program Outcome G was 3.60/4.00 as compared to 3.59/4.00 in 2011-2012.

**Findings (2011-2012) - Target: Met**
Assessments of PROGRAM OUTCOME G (with measures G1-G6) include 9 unique assessments across 5 course offerings including courses as shown in the attached course embedded assessment curriculum maps. Course embedded assessments for 2011-2012 show that overall student performance for Program Outcome G was 3.60/4.00 as compared to 3.59/4.00 in 2010-2011.

**M 20: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME G)**
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

Source of Evidence: Benchmarking of learning outcomes against peers

**Connected Document:**
- [2011-2012 ECE Senior Exit Survey](#)

**Target:**
An average target score for questions relating to this student learning outcome is 5.0/7.0 for surveyed students.

**Findings (2012-2013) - Target: Met**
EBI questions 60 and 61 correspond to ABET Program Outcome G. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 2 questions was 5.61/7.00, exceeding our target of 5.00.
Findings (2011-2012) - Target: Met
EBI data was mistakenly not collected during the 2010-2011 academic year. This data would have normally been used for the current (2011-2012) academic year report. Results from question 27 of the ECE senior exit survey have been used in place of the EBI data. This question surveys the student’s opinion of their knowledge and skills as relates to ABET outcomes A-M. These results have been scaled to the EBI 7 point scale.

Part G of ECE senior exit survey questions 27 addresses student ability to communicate effectively. These questions relate directly to ABET outcome G. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome G was 6.08/7.00.

Mechanical Engineering B.S.M.E. (1)
O 7: Communicate effectively
An ability to communicate effectively

Related Measures

M 19: Writing score in ME 360 and ME 460
Average of the writing score by English Department consultant on lab reports for ME 360 and ME 460 greater than 80/100

Source of Evidence: Writing exam to assure certain proficiency level

Target:
>80%

Findings (2011-2012) - Target: Met
Score was 85%. Target was met.

M 20: Co-op Survey Communication
Achieve average scores on questions 12 and 13 of the Co-op Employer Survey of greater than 1.9/3.0.

Source of Evidence: Academic direct measure of learning - other

Target:
>1.9/3

Findings (2012-2013) - Target: Met
Score was 2.05/3

Findings (2011-2012) - Target: Met
Score was 2.3/3. Target was met.

M 21: ME 490 rubric communication
Achieve average scores on item “g” of the ME 490 assessment rubric greater than 3/5.

Source of Evidence: Academic direct measure of learning - other

Target:
>3/5

Findings (2012-2013) - Target: Met
Score of 4.4/5

Findings (2011-2012) - Target: Met
Score was 4.29/5. Target was met.