Mission / Purpose

Vision: The Department of Electrical and Computer Engineering will be a nationally recognized leader in student-centered education, research, and innovation. Mission: The mission of the Department of Electrical and Computer Engineering is to serve the state, nation, and global community by advancing the boundaries of knowledge through innovative research and education of the next generation of leaders.

Goals

**G 1:Distinguished Graduates**
We will provide high-quality experiences that educate distinguished bachelors, masters, and doctoral graduates.

**G 2:Innovative Research**
We will develop, conduct, and disseminate innovative research that engages students at all levels.

**G 3:Faculty Dedication**
We will foster faculty dedication to excellence in education, research, and service.

Student Learning Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans

**SLO 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.

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**Relevant Associations:**

**Standard Associations:**

ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)

3.2.1 (a) an ability to apply knowledge of mathematics, science, and engineering

SACS 3.3.1

3.3.1.1 Educational programs, to include student learning outcomes

**General Education/Core Curriculum Associations:**

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

**Strategic Plan Associations:**

University of Alabama

1.1 Promote and enhance areas of academic, scholarship, and research excellence.

**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.

**SLO 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.

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**Relevant Associations:**

**Standard Associations:**
- ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
  - 3.2.2 (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- SACS 3.3.1
  - 3.3.1.1 Educational programs, to include student learning outcomes

**General Education/Core Curriculum Associations:**
- 9 Natural Science - SLO is related to a hands-on laboratory or field experience that emphasizes the scientific method and analysis of data

**Strategic Plan Associations:**
- University of Alabama
  - 1.1 Promote and enhance areas of academic, scholarship, and research excellence.

**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.
SLO 6: ABET PROGRAM OUTCOME C
(Skills/Abilities) Students shall demonstrate an ability to design a system, component, or process to meet desired needs. MEASURES: Graduates should be able to:
C1. Describe a formal design process and discuss how it differs from a "hobbyist" approach.
C2. Write design specifications (quantitative and measurable) based on a general description of a system component, or process.
C3. Conduct an evaluation of preliminary designs and analyze alternatives.
C4. Write a project plan including a schedule with major milestones, a budget, a validation test plan, and a list of critical aspects.
C5. Design a system, component, or process to meet a set of specifications.
C6. Design, conduct, and interpret a validation test.

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Relevant Associations:

Standard Associations:
ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
3.2.3 (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

Strategic Plan Associations:
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures:

M 11: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME C)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME C) 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 C (with measures C1-C6) include 14 unique assessments across 9 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 C was 3.43/4.00 as compared to 3.40/4.00 in 2011-2012. The assessment for one measure (C2 -- Write design specifications (quantitative and measureable) based on a general description of a system component, or process) assessed across three
course offerings was 2.88/4.00. The Fall 2012 score was 2.60/4.00, and the Spring 2013 score was 3.16/4.00. The instructor believes the Fall score to be an anomalous data point, but did indicate that a significant laboratory restructuring should provide additional assessment opportunities.

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

Assessments of PROGRAM OUTCOME C (with measures C1-C6) include 14 unique assessments across 9 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 C was 3.34/4.00 as compared to 3.38/4.00 in 2010-2011. The assessment for one measure (C5 -- Design a system, component, or process or meet a set of specifications) assessed across three course offerings was 2.50/4.00. The instructors recommend:

(ECE285) More training on system design and using approximations/estimates to solve electrical and computer engineering problems as well as discussions on their limitations. (ECE383 - Fall 2011)

More instruction on system design is recommended by the course instructor. (ECE383 - Spring 2012)

Additional instruction in system design, relative to a given set of specifications will be performed in the class lecture. Additional corresponding assessments will be given.

**Related Action Plans (by Established cycle, then alpha):**

For full information, see the *Details of Action Plans* section of this report.

**Action plan for ABET C5 assessment**

_Established in Cycle: 2011-2012_

The assessment for one measure (C5 -- Design a system, component, or process or meet a set of specifications) assessed across th...

**M 12:Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME C)**

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 53, 74-81 correspond to ABET Program Outcome C. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 9 questions was 5.20/7.00, 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 C of ECE senior exit survey questions 27 addresses student ability to an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. These questions relate directly to ABET outcome C. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome C was 5.97/7.00.

SLO 7: ABET PROGRAM OUTCOME D
(Skills/Abilities) Students shall demonstrate an ability to function on multidisciplinary teams. MEASURES: Graduates should be able to: D1. Discuss the elements of good teaming, such as resolving conflict, conducting self-evaluation, and providing leadership. D2. Work as members of a team to complete a project. D3. Communicate effectively with team members regardless of technical discipline.

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Relevant Associations:

Standard Associations:
ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
3.2.4 (d) an ability to function on multidisciplinary teams
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

Strategic Plan Associations:
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures:

M 13: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME D)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME D) 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 D (with measures D1-D3) include 3 unique assessments across 2 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 D was 3.69/4.00 as compared to 3.68/4.00 in 2011-2012.

**Findings (2011-2012) - Target: Met**  
Assessments of PROGRAM OUTCOME D (with measures D1-D3) include 3 unique assessments across 2 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 D was 3.68/4.00 as compared to 3.30/4.00 in 2010-2011.

**M 14:Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME D)**  
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 54 corresponds to ABET Program Outcome A. The 2011-2012 EBI data is used for 2012-2013 assessment, and the score on this question was 5.56/7.00, 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 D 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 D. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome D was 6.12/7.00.

**SLO 8:ABET PROGRAM OUTCOME E**  
(Skills/Abilities) Students shall demonstrate an ability to identify, formulate, and solve engineering problems. MEASURES: Graduates should be able to: E1. Decompose a relatively complicated system into simpler components. E2. Develop useful approximations/estimates and discuss limitations. E3. Describe a practical engineering problem in an appropriate form that captures the dominant features and processes. E4. Find and utilize resources from both inside and outside of class lectures and textbooks to solve engineering problems. E5. Recognize qualitative behavior/trends in physical processes: proportionality, inverse, and positive/negative. E6. Develop a process to solve a practical engineering problem.
Relevant Associations:

Standard Associations:
ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
3.2.5 (e) an ability to identify, formulate, and solve engineering problems
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

Strategic Plan Associations:
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures:

M 15: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME E)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME E) 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 E (with measures E1-E6) include 9 unique assessments across 7 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 E was 3.25/4.00 as compared to 3.24/4.00 in 2011-2012. The assessment for one measure (E3) assessed in one course offering (ECE350 - Spring 2013) was 2.78/4.00. At the request of the ECE350 instructor, and on approval of the departmental Industrial Advisory Board, it was recommended to reduce the coverage on dc machines to allow more time for topics associated with this measure.

Findings (2011-2012) - Target: Partially Met
Assessments of PROGRAM OUTCOME E (with measures E1-E6) include 9 unique assessments across 7 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 E was 3.17/4.00 as compared to 3.33/4.00 in 2010-2011. The assessment for one measure (E1) assessed in one course offering (ECE380 - Fall 2011) was 2.75/4.00. The assessment for one measure (E2) assessed in one course offering
(ECE285 - Fall 2011) was 2.60/4.00. The instructor recommends more training on system design and using approximations/estimates to solve electrical and computer engineering problems as well as discussions on their limitations. The assessment average for one measure (E3) assessed across two course offerings (ECE350 - Spring 2012 and ECEC486 - Spring 2012) was 2.86/4.00. The ECE486 instructor recommends that additional lecture time and assignments need to focus on students’ ability to describe both system-level and sub-system level behaviors and characteristics. Students should be asked to analyze given designs and also to create designs meeting given specifications.

**Related Action Plans (by Established cycle, then alpha):**

For full information, see the *Details of Action Plans* section of this report.

**Action plan for ABET E1, E2, and E3 assessments**

*Established in Cycle: 2011-2012*

The assessment for one measure (E1) assessed in one course offering (ECE380 - Fall 2011) was 2.75/4.00. The assessment for on...

**M 16:Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME E)**

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 55-57 correspond to ABET Program Outcome E. The 2011-2012 EBI data is used for 2012-2013 assessment, and the average score on these 3 questions was 6.04/7.00, 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 E of ECE senior exit survey questions 27 addresses student ability to identify, formulate, and solve engineering problems. These questions relate directly to ABET outcome E. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome E was 6.08/7.00.
SLO 9: ABET PROGRAM OUTCOME F

(Discipline Knowledge) Students shall demonstrate an understanding of professional and ethical behavior. MEASURES: Graduates should be able to: F1. Define engineering ethics and its importance in the career of an engineer. F2. Discuss an engineer's professional responsibilities. F3. Demonstrate knowledge of engineering ethical codes. F4. Given a scenario identify ethical concerns, describe the appropriate behavior, and discuss the ethical basis for these choices.

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Relevant Associations:

Standard Associations:
- ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
  3.2.6 (f) an understanding of professional and ethical responsibility
- SACS 3.3.1
  3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations:
- 6 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

Strategic Plan Associations:
- University of Alabama
  1.1 Promote and enhance areas of academic, scholarship, and research excellence

Related Measures:

M 17: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME F)
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.

M 18: 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.

SLO 10: ABET PROGRAM OUTCOME G

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

Standard Associations:
ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
3.2.7 (g) an ability to communicate effectively
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations:
3.3.1.1 Educational programs, to include student learning outcomes

Strategic Plan Associations:
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

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.

**SLO 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.

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**Relevant Associations:**

**Standard Associations:**
- ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
- 3.2.8 (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- SACS 3.3.1
- 3.3.1.1 Educational programs, to include student learning outcomes
General Education/Core Curriculum Associations:
5 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
10 Social and Behavioral Sciences - SLO is related to human behavior, social structures or economics

Strategic Plan Associations:
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

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.

SLO 12: ABET PROGRAM OUTCOME I
(Skills/Abilities) Students shall demonstrate a recognition for the need for and an ability to engage in life-long learning. MEASURES: Graduates should be able to: I1. Discuss how life-long learning benefits practicing engineers. I2. Discuss methods for learning a new technology. I3. Understand the value of professional engineering societies as a resource for life-long learning materials.

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Relevant Associations:

Standard Associations:
- ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
  - 3.2.9 (i) a recognition of the need for, and an ability to engage in life-long learning
- SACS 3.3.1
  - 3.3.1.1 Educational programs, to include student learning outcomes

Strategic Plan Associations:
- University of Alabama
  - 1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures:

M 23: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME I)
Direct assessment of student learning outcome (ABET PROGRAM OUTCOME I) 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 I (with measures I1-I3) 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 I was 3.57/4.00 as compared to 3.63/4.00 in 2012-2012.

**Findings (2011-2012) - Target: Met**
Assessments of PROGRAM OUTCOME I (with measures I1-I3) 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 I was 3.63/4.00 as compared to 3.58/4.00 in 2010-2011.

M 24: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME I)
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 62 corresponds to ABET Program Outcome E. The 2011-2012 EBI data is used for 2012-2013 assessment, and the score on this question was 6.56/7.00, 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 I of ECE senior exit survey questions 27 addresses student recognition of the need for, and an ability to engage in, life-long learning. These questions relate directly to ABET outcome I. For 39 surveyed
students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome I was 6.19/7.00.

SLO 13: ABET PROGRAM OUTCOME J
(Discipline Knowledge) Students shall demonstrate knowledge of contemporary issues.

MEASURES: Graduates should be able to: J1. Recognize social impacts of technology & engineering. J2. Recognize political issues related to engineering.

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Relevant Associations:

Standard Associations:
- ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
  3.2.10 (j) a knowledge of contemporary issues
- SACS 3.3.1
  3.3.1.1 Educational programs, to include student learning outcomes

Strategic Plan Associations:
- University of Alabama
  1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures:

M 25: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME J)

Direct assessment of student learning outcome (ABET PROGRAM OUTCOME J) 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 J (with measures J1-J2) include 4 unique assessments across 2 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 J was 3.81/4.00 as compared to 3.93/4.00 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 J (with measures J1-J2) include 4 unique assessments across 2 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 J was 3.93/4.00 as compared to 3.44/4.00 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 26: Indirect assessment of student learning outcome (ABET PROGRAM OUTCOME J)**
Indirect assessment of this student learning outcome will be made through exiting senior completion of the Engineering Benchmark Index (EBI) survey instrument.

**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 63 corresponds to ABET Program Outcome E. The 2011-2012 EBI data is used for 2012-2013 assessment, and the score on this question was 6.29/7.00, 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 J of ECE senior exit survey questions 27 addresses student knowledge of contemporary issues. These questions relate directly to ABET outcome J. For 39 surveyed students, the 2011-2012 assessment results show that overall student opinion of their performance for Program Outcome J was 5.60/7.00.

**SLO 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.

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**Relevant Associations:**
Standard Associations:
ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
  3.2.11 (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
SACS 3.3.1
  3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations:
  1 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
  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 Natural Science - SLO is related to a hands-on laboratory or field experience that emphasizes the scientific method and analysis of data

Strategic Plan Associations:
University of Alabama
  1.1 Promote and enhance areas of academic, scholarship, and research excellence.

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.

SLO 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.

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Relevant Associations:

Standard Associations:
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations:
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.

Strategic Plan Associations:
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

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 surveys responses on the question corresponding to this outcome averaged 3.60, which falls below 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 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.

Source of Evidence: Academic indirect indicator 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 M (with measures M1-M4) include 6 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.
SLO 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: M1. Understanding of differential equations. M2. Understanding of complex algebra and variables. M3. Understanding linear algebra and matrix methods. M4. Understanding of discrete mathematics.

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Relevant Associations:

Standard Associations:
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations:
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

Strategic Plan Associations:
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

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

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 (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

**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**
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.

SLO 17: An Improvement Outcome Derived from the 2010-11 Assessment Findings
(An Improvement Outcome Derived from the 2010-11 Assessment Findings) From 2010-2011 Student Learning Outcome 3, EBI assessment results indicate a need to better address political issues with respect to engineering design. Additional instruction in will be undertaken in the ECE capstone design sequence for designing a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

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**Relevant Associations:**

**Standard Associations:**
- ABET 2011-2012 Baccalaureate Level Engineering Student Outcomes (a-k)
  - 3.2.10 (j) a knowledge of contemporary issues
- SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

**Related Measures:**

**M 33:** Assessment of Improvement Outcome Derived from the 2010-11 Assessment Findings
Assessment of Improvement Outcome Derived from the 2010-11 Assessment Findings.

Source of Evidence: Academic indirect indicator of learning - other

**Target:**
Assessments related to ABET Program Outcome J will meet all targets. This includes an average of 3.0/4.0 or greater for all ABET Program Outcome J direct assessments and 5.0/7.0 or greater for all ABET Program Outcome J indirect assessments.

**Findings (2012-2013) - Target: Partially Met**
The 2012-2013 rubric scores for the 4 designated ABET Program Outcome measures are: C5-3.01, E1-3.14, E2-3.10, and E3-2.78. Of the 4 measures, 3 reached the target, and one fell short.

**Findings (2011-2012) - Target: Met**
All ABET Program Outcome J assessment targets were met.

**Other Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans**

**OthOtcm 1:** The program will improve and sustain a high level of recognized quality
The program will improve and sustain a high level of recognized quality.

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**Related Measures:**

**M 1:** Program Outcome 1: Measure 1.1
The department will offer at least one opportunity each year to advance capabilities of current faculty through training and instructional programs addressing undergraduate teaching effectiveness. Accordingly, ECE faculty will average 4.0/5.0 on UA student opinion of instruction surveys for undergraduate courses.

Source of Evidence: Student course evaluations on learning gains made

**Target:**
4.0/5.0 average on SOI instructor grade for all ECE courses.

**Findings (2012-2013) - Target: Partially Met**
The weighted average instructor grade on the SOI results for the 2012-2013 academic year was 3.84/5.00.

**M 2:** Program Outcome 1: Measure 1.2
By the year 2020, 100% of ECE students will participate in the Engineering+ program. The goal is a linear increase each year from the current participation level until the 100% target is attained. The department will organize at least one informational event each term to promote Engineering+. Participation will be assessed through undergraduate surveys.

Source of Evidence: Academic indirect indicator of learning - other

**Target:**
The target for the 2012-2013 academic year is 30% undergraduate student participation in Engineering+ activities.

**Findings (2012-2013) - Target: Not Reported This Cycle**
This data was not assessed.

OthOtcn 2: The program will build and sustain an optimal level of annual program enrollments and degree completions
The program will build and sustain an optimal level of annual program enrollments and degree completions.

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**Related Measures:**

**M 3: Program Outcome 2: Measure 2.1**
By the year 2020, the department will enroll 525 undergraduate students. Undergraduate enrollment will be measured each fall using university census data. The goal is a linear increase each year from the current enrollment level until the target is attained.

Source of Evidence: Academic direct measure of learning - other

**Target:**
To reach our undergraduate enrollment goal of 525 by 2020, our enrollment each year should increase by an average of 6.25 students. Thus, the target for 2012-2013 is 481 undergraduate students.

**Findings (2012-2013) - Target: Met**
The undergraduate enrollment for the 2012-2013 academic year was 491. This exceeds the targeted enrollment.

**M 4: Program Outcome 2: Measure 2.2**
By the year 2020, the department will produce 70 BS degrees each calendar year. Undergraduate degree production will be measured each calendar year (Fall, Spring, Summer). The goal is a linear increase each year from the current graduation level until the target is attained.

Source of Evidence: Academic direct measure of learning - other

**Target:**
To reach the goal of 70 BSEE degrees by 2020, an average increase of 2.25
graduates per year is required. Thus, the target for 2012-2013 is 52 graduates.

Findings (2012-2013) - Target: Met
For 2012-2013, the number of undergraduate degrees conferred was 60, which exceeds the target of 52.

OthOtcm 3: The program will be highly valued by its program graduates and other key constituencies it serves
The program will be highly valued by its program graduates and other key constituencies it serves.

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Related Measures:

M 5: Program Outcome 3: Measure 3.1
80% of graduating seniors will report an average of 3.0/4.0 or greater for relevant questions on an ECE department senior exit survey.

Source of Evidence: Exit interviews with grads/program completers

Target:
80% favorably or about the same on question 28 and 80% yes on question 29.

Findings (2012-2013) - Target: Met
In range responses to question 26 were 85%, and in range responses to question 29 were 95%, thus meeting the target.

M 6: Program Outcome 3: Measure 3.2
80% of respondents will report an average of 3.0/4.0 or greater for relevant questions on an ECE alumni and employer survey.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:
80% of respondents will report an average of 3.0/4.0 or greater for relevant questions on an ECE alumni and employer survey.

Findings (2012-2013) - Target: Not Reported This Cycle
This outcome was not assessed during the 2012-2013 assessment cycle.

Details of Action Plans for This Cycle (by Established cycle, then alpha)

Action plan for ABET C5 assessment
The assessment for one measure (C5 -- Design a system, component, or process or meet a set of specifications) assessed across three course offerings was 2.50/4.00.
The instructors recommend: (ECE285) More training on system design and using approximations/estimates to solve electrical and computer engineering problems as well as discussions on their limitations. (ECE383 - Fall 2011) More instruction on
system design is recommended by the course instructor. (ECE383 - Spring 2012)
Additional instruction in system design, relative to a given set of specifications will be
performed in the class lecture. Additional corresponding assessments will be given.

Established in Cycle: 2011-2012
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
Measure: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME C) | Outcome/Objective: ABET PROGRAM OUTCOME C

Action plan for ABET E1, E2, and E3 assessments
The assessment for one measure (E1) assessed in one course offering (ECE380 - Fall 2011) was 2.75/4.00. The assessment for one measure (E2) assessed in one course offering (ECE285 - Fall 2011) was 2.60/4.00. The instructor recommends more training on system design and using approximations/estimates to solve electrical and computer engineering problems as well as discussions on their limitations. The assessment average for one measure (E3) assessed across two course offerings (ECE350 - Spring 2012 and ECEC486 - Spring 2012) was 2.86/4.00. The ECE486 instructor recommends that additional lecture time and assignments need to focus on students' ability to describe both system-level and sub-system level behaviors and characteristics. Students should be asked to analyze given designs and also to create designs meeting given specifications.

Established in Cycle: 2011-2012
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
Measure: Direct assessment of student learning outcome (ABET PROGRAM OUTCOME E) | Outcome/Objective: ABET PROGRAM OUTCOME E

Address SOI Instructor Grade
The 2012-2013 SOI reports will be analyzed to determine areas for instructional improvement. Upon analysis, a specific plan to address the issues will be implemented.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium
Implementation Description: See description
Projected Completion Date: 01/30/2014
Responsible Person/Group: Assessment Committee/Undergraduate Program Committee
Additional Resources Requested: None