Mission / Purpose

The mission of the Department of Aerospace Engineering and Mechanics is: to provide high-quality undergraduate, graduate, and continuing education that supports the aerospace, and other, industries; to conduct high-quality research on critical problems in the aerospace, and other, industries that will advance the body of scientific knowledge and support the department's education programs; and serve constituencies (e.g. individual practicing engineers and computer scientists, industry, government, educational entities, and technical societies) through professional expertise, active involvement, and availability of facilities.

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

SLO 4: ABET Student Outcome (a)
Graduate will demonstrate a knowledge of mathematics, science, and engineering (content knowledge).

Related Measures

M 7: SEI Survey Data
Senior Exit Interview (SEI) survey results: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

M 8: EBI Survey Data
Educational Benchmark, Inc. survey data: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

SLO 5: ABET Student Outcome (b)
Graduates will demonstrate the ability to design and conduct experiments, as well as to analyze and interpret data (skills/ability).

Related Measures

M 7: SEI Survey Data
Senior Exit Interview (SEI) survey results: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

M 8: EBI Survey Data
Educational Benchmark, Inc. survey data: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

SLO 6: ABET Student Outcome (c)
Graduates will demonstrate 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 (skills/ability).

Related Measures

M 7: SEI Survey Data
Senior Exit Interview (SEI) survey results: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

M 8: EBI Survey Data
Educational Benchmark, Inc. survey data: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

SLO 7: ABET Student Outcome (j)
Graduates will demonstrate a knowledge of contemporary issues (content knowledge).

Related Measures

M 7: SEI Survey Data
Senior Exit Interview (SEI) survey results: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

M 8: EBI Survey Data
Educational Benchmark, Inc. survey data: ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

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

OthOtcm 1: Program Quality
The program will improve and sustain a high level of recognized quality.
Related Measures

M 1: Pass Rate - FE Exam
Average pass rate for BSAE students on Fundamentals of Engineering (FE) Examination. Information provided by the College of Engineering.
Source of Evidence: Certification or licensure exam, national or state

Connected Document
3-year FE Results Summaries

Target:
No Target Set

M 2: ACT: Incoming Freshmen
Average ACT composite score for incoming freshmen. The quality of our program may be correlated with our ability to attract high quality students. Information provided by the College of Engineering.
Source of Evidence: Standardized test of subject matter knowledge

OthOtcm 2: Program Optimal Enrollment
The program will build and sustain an optimal level of annual program enrollments and degree completions.

Related Measures

M 3: Enrollment
Number of students enrolled in BSAE program (Fall Semester). Data provided by College of Engineering.
Source of Evidence: Existing data

Target:
Sufficient to sustain required graduation rate

M 4: Degrees Conferred
Number of students receiving BSAE degrees during assessment cycle. Data provided by College of Engineering, Internal Audits, and/or Office of Institutional Research.
Source of Evidence: Academic indirect indicator of learning - other

Target:
ACHE requires a 5-year average of 7 graduates

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

Connected Documents
BSAE Graduate Placement
Senior Program Satisfaction (EBI data)

Related Measures

M 5: Placement of Graduates
Career placement demographic of students receiving BSAE degrees.
Source of Evidence: Exit interviews with grads/program completers

Target:
No Target

Connected Document
BSAE Graduate Placement

M 6: Graduating Student Satisfaction
Degree to which students are satisfied with the education they have received. Data obtained from Student Exit Interviews.
Source of Evidence: Exit interviews with grads/program completers

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

Capstone Design Experience
A committee comprised of AEM faculty members and representative from the AEM Industrial Advisory Board has been formed to examine the senior design (capstone design) experience.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium
Implementation Description: The Capstone Design Committee will identify issues with the senior design course sequence and will make recommendations for the implementation of recommendations to improve the capstone design experience.
Responsible Person/Group: AEM Undergraduate Program Coordinator
Detailed Assessment Report
2012-2013 Aerospace Engineering B.S.A.E.
As of 7/15/2014 02:55 PM CENTRAL

Mission / Purpose
The mission of the Department of Aerospace Engineering and Mechanics is: to provide high-quality undergraduate, graduate, and continuing education that supports the aerospace, and other, industries; to attract and retain high-quality students; to conduct high-quality research on critical problems in the aerospace, and other, industries that will advance the body of scientific knowledge and support the department's education programs; and serve constituencies (e.g. individual practicing engineers and computer scientists, industry, government, educational entities, and technical societies) through professional expertise, active involvement, and availability of facilities.

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

SLO 4: ABET Student Outcome (a)
Graduate will demonstrate a knowledge of mathematics, science, and engineering (content knowledge).

Connected Documents
3-year FE Results Summaries
BSE Curriculum Map #1
BSE Curriculum Map #2
Participation of BSE Students in University Scholars Program

Related Measures
M 7: SEI Survey Data
Senior Exit Interview (SEI) results with regard to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

Connected Document
3-year FE Results Summaries

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (4.38) & 2013 (4.53): Value in parentheses indicates average value from SEI survey for the spring semester of the indicated year.

M 8: EBI Survey Data
Educational Benchmark, Inc. survey data as applied to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

Connected Documents
ABET Outcomes - Coverage and Importance
BSE Curriculum Map #1
BSE Curriculum Map #2

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (6.17/5.96); Values in parentheses (average EBI survey value UA / average EBI survey value all schools surveyed). Scale of 1 to 10. Note values for 2013 not received from Dean's Office at the time report filed.

SLO 5: ABET Student Outcome (b)
Graduates will demonstrate the ability to design and conduct experiments, as well as to analyze and interpret data (skills/ability).

Connected Documents
3-year FE Results Summaries
BSE Curriculum Map #1
BSE Curriculum Map #2

Related Measures
M 7: SEI Survey Data
Senior Exit Interview (SEI) results with regard to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

Connected Document
3-year FE Results Summaries

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (3.92) & 2013 (4.47): Value in parentheses indicates average value from SEI survey for the spring semester of the indicated year.
M 8: EBI Survey Data
Educational Benchmark, Inc. survey data as applied to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

Connected Documents
ABET Outcomes - Coverage and Importance
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (5.15/5.52); Values in parentheses (average EBI survey value UA / average EBI survey value all schools surveyed). Scale of 1 to 10. Note values for 2013 not received from Dean's Office at the time report filed.

SLO 6: ABET Student Outcome (c)
Graduates will demonstrate 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 (skills/ability).

Connected Documents
ABET Outcomes - Coverage and Importance
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Related Measures

M 7: SEI Survey Data
Senior Exit Interview (SEI) results with regard to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

Connected Document
3-year FE Results Summaries

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (3.38) & 2013 (3.73): Value in parentheses indicates average value from SEI survey for the spring semester of the indicated year.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Capstone Design Experience
Established in Cycle: 2012-2013
A committee comprised of AEM faculty members and representative from the AEM Industrial Advisory Board has been formed to examine...

M 8: EBI Survey Data
Educational Benchmark, Inc. survey data as applied to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

Connected Documents
ABET Outcomes - Coverage and Importance
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (3.75/4.55); Values in parentheses (average EBI survey value UA / average EBI survey value all schools surveyed). Scale of 1 to 10. Note values for 2013 not received from Dean's Office at the time report filed.

SLO 7: ABET Student Outcome (j)
Graduates will demonstrate a knowledge of contemporary issues (content knowledge).

Connected Documents
3-year FE Results Summaries
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Related Measures

M 7: SEI Survey Data
Senior Exit Interview (SEI) results with regard to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Exit interviews with grads/program completers

Connected Document
3-year FE Results Summaries

Target:
No Target

Finding (2012-2013) - Target: Met
2012 (3.54) & 2013 (3.33): Value in parentheses indicates average value from SEI survey for the spring semester of the indicated year.
M 8: EBI Survey Data
Educational Benchmark, Inc. survey data as applied to ABET Student Outcomes (a), (b), (c), and (j).
Source of Evidence: Benchmarking of learning outcomes against peers

Connected Documents
- ABET Outcomes - Coverage and Importance
- BSAE Curriculum Map #1
- BSAE Curriculum Map #2

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (4.40/4.97); Values in parentheses (average EBI survey value UA / average EBI survey value all schools surveyed). Scale of 1 to 10. Note values for 2013 not received from Dean's Office at the time report filed.

SLO 8: (RETIRE) An Improvement Outcome
(An Improvement Outcome Derived from the 2010-11 Assessment Findings) Improve design knowledge and skills, and understanding of basic mechanics underpinnings of the aerospace stem areas (aerodynamics, structures, dynamics & control)

Related Measures

M 9: (RETIRE) FE Performance
Student performance on select Fundamentals of Engineering (FE) examination topics.
Source of Evidence: Academic direct measure of learning - other

Connected Documents
- 3-year FE Results Summaries
- BSAE Curriculum Map #1
- BSAE Curriculum Map #2

M 10: (RETIRE) Improve FE exam pass rate
Improvement in pass rate of the FE examination
Source of Evidence: Academic direct measure of learning - other

Connected Document
- 3-year FE Results Summaries

Target:
2011-2012: Establish baseline trend

M 11: (RETIRE) External Measures
External measures (e.g. FE exam, ABET accreditation)
Source of Evidence: Academic indirect indicator of learning - other

Connected Document
- 3-year FE Results Summaries

M 12: (RETIRE) Career placement of graduates
Career placement of graduates
Source of Evidence: Academic indirect indicator of learning - other

M 13: (RETIRE) Annual graduation rates
Annual graduation rates
Source of Evidence: Academic indirect indicator of learning - other

M 14: (RETIRE) Enrollment trends
Enrollment trends
Source of Evidence: Academic indirect indicator of learning - other

M 15: (RETIRE) Senior/Alumnae Interviews/Surveys
Satisfaction indicated in Senior Interviews/Alumnae Feedback
Source of Evidence: Academic indirect indicator of learning - other

Connected Document
- Senior Program Satisfaction (EBI data)

M 16: (RETIRE) Number of Undergraduates Involved in Faculty Research
Number of undergraduate students involved in faculty research.
Source of Evidence: Academic direct measure of learning - other

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

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

Connected Documents
- BSAE Graduate Placement
- Participation of BSAE Students in University Scholars Program

Related Measures

M 1: Pass Rate - FE Exam
Average pass rate for BSAE students on Fundamentals of Engineering (FE) Examination.
Source of Evidence: Certification or licensure exam, national or state

Connected Document
3-year FE Results Summaries

Target:
No Target Set

Finding (2012-2013) - Target: Met
100%: Average UA FE Exam pass rate. 89%: Average National FE Exam pass rate. 94% Average Carnegie Compparitor pass rate.

M 2: ACT: Incoming Freshmen
Average ACT composite score for incoming freshmen. The quality of our program may be correlated with our ability to attract high quality students.
Source of Evidence: Standardized test of subject matter knowledge

Connected Documents
BSAE Honors Program
BSAE University Scholars Program
Participation of BSAE Students in University Scholars Program

Target:
No Target

Connected Document
Participation of BSAE Students in University Scholars Program

Finding (2012-2013) - Target: Met
Fall 2013 (29.82): Number in parenthesis is the average composite ACT score for freshmen in the BSAE program. This indicates that 94.64% of students taking the ACT scored below the average incoming student in the BSAE program.

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

Related Measures

M 3: Enrollment
Number of students enrolled in BSAE program (Fall Semester).
Source of Evidence: Existing data

Connected Document
3-year FE Results Summaries

Target:
No target set.

Finding (2012-2013) - Target: Met
Data for past 3 years.
Fall 2011 182
Fall 2012 209
Fall 2013 236

M 4: Degrees Conferred
Number of students receiving BSAE degrees during assessment cycle.
Source of Evidence: Existing data

Connected Document
3-year FE Results Summaries

Target:
7.5 BSAE graduates per year (5-year average). Alabama Commission on Hgher Education (ACHE) requirement.
Finding (2012-2013) - Target: Met
2013: 17 BSAE degrees conferred. 5-year average: 15 BSAE degrees conferred per year.

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

Connected Documents
BSAE Graduate Placement
Senior Program Satisfaction (EBI data)

Related Measures

M 5: Post-Graduate Placement
Placement demographic of students receiving BSAE degrees.
Source of Evidence: Exit interviews with grads/program completers

Connected Documents
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Target:
No target set.

Finding (2012-2013) - Target: Met
Placement data:
2011 (16 E, 2 G, 0 O, 0 U)
2012 (9 E, 3 G, 0 O, 3 U)
2013 (4 E, 5 G, 1 O, 7 U)

Note: In the above data E indicates a job in an engineering field, G indicates the student went to graduate school, O indicates other profession, and U indicates that the students placement status is unknown.

M 6: Graduating Student Satisfaction
Degree to which students are satisfied with the education they have received.
Source of Evidence: Exit interviews with grads/program completers

Connected Documents
ABET Outcomes - Coverage and Importance
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Target:
No target set.

Finding (2012-2013) - Target: Met
2012 (3.77) & 2013 (3.93): Value in parentheses represent average survey result for student satisfaction with curriculum (from Student Exit Interview survey). Scale of 1 to 5.

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

Action Plan
No action plan required. Progress is being made with regard to Applied Engineering Mechanics and Thermal Science.

Established in Cycle: 2012-2013
Implementation Status: Finished
Priority: Low

Relationships (Measure | Outcome/Objective):
  Measure: Pass Rate - FE Exam | Outcome/Objective: ABET Student Outcome (a)

Capstone Design Experience
A committee comprised of AEM faculty members and representative from the AEM Industrial Advisory Board has been formed to examine the senior design (capstone design) experience.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
  Measure: SEI Survey Data | Outcome/Objective: ABET Student Outcome (c)

Implementation Description: The Capstone Design Committee will identify issues with the senior design course sequence and will make recommendations for the implementation of recommendations to improve the capstone design experience.

Responsible Person/Group: AEM Undergraduate Program Coordinator
Detailed Assessment Report
2011-2012 Aerospace Engineering B.S.A.E.
As of: 7/15/2014 02:57 PM CENTRAL

Mission / Purpose
The mission of the Department of Aerospace Engineering and Mechanics is: to provide high-quality undergraduate, graduate, and continuing education that supports the aerospace, and other, industries; to attract and retain high-quality students; to conduct high-quality research on critical problems in the aerospace, and other, industries that will advance the body of scientific knowledge and support the department's education programs; and serve constituencies (e.g. individual practicing engineers and computer scientists, industry, government, educational entities, and technical societies) through professional expertise, active involvement, and availability of facilities.

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

SLO 1: Discipline Knowledge - General
(Discipline Knowledge) BSAE graduates will have a fundamental knowledge of basic mechanics, in particular the three stem areas of aerospace structures, flight dynamics and control, aerodynamics and propulsion.

Connected Documents
3-year FE Results Summaries
BSAE Curriculum Map #1
BSAE Curriculum Map #2
Participation of BSAE Students in University Scholars Program

Related Measures

M 1: Senior Performance on FE Exam
Student performance in related areas of the Fundamentals of Engineering (FE) exams required in their senior year.

Caveats:
1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) “Other Disciplines” examination. There is no FE exam especially for AEs since aerospace activity is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator group, there is no guarantee that the FE exam is taken by ALL BSAE seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

Results:

1. Pass Rate: shows steady decline, though still above 80%, over the last 3 years. The last year was the first year that UA pass rate went below the other comparison groups.
2. Computers: shows consistent performance above 80% exceeding comparison groups
3. Engineering Mechanics: shows fluctuations, while still largely in line with comparison groups, also shows decline relative to comparison groups.
4. Thermal Science: Shows similar trends as comparison groups, though declines relative to them.
5. Profession (Ethics): Shows consistent performance above 80% that is higher or on par with comparison groups.

Source of Evidence: Academic direct measure of learning - other

Connected Document
3-year FE Results Summaries

Target:
No Target

Finding (2011-2012) - Target: Met

Caveats:
1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) “Other Disciplines” examination. There is no FE exam especially for AEs since aerospace activity is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator, there is no guarantee that the FE exam is taken by ALL seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

Results:
1. Pass Rate: shows steady decline, though still above 80%, over the last 3 years. The last year was the first year that UA pass rate went below the other comparison groups.
2. Computers: shows consistent performance above 80% exceeding comparison groups.
3. Engineering Mechanics: shows fluctuations, while still largely in line with comparison groups, also shows decline relative to comparison groups.
4. Thermal Science: Shows similar trends as comparison groups, though declines relative to them.
5. Profession (Ethics): Shows consistent performance above 80% that is higher or on par with comparison groups.

**Connected Document**

3-year FE Results Summaries

**M 2: Participation on Enhanced Academic Activities**

Participation in: AEM Honors, University Scholars, Faculty Research

Source of Evidence: Academic direct measure of learning - other

**Connected Documents**

BSAE Honors Program
BSAE University Scholars Program
Participation of BSAE Students in University Scholars Program

**Target:**
No Target

**Connected Document**

Participation of BSAE Students in University Scholars Program

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

Participation in the University Scholars program has grown since it began. ... The program has the effect of requiring BSAE students to take advanced courses while still undergraduates, thereby exposing them to more in-depth discipline knowledge, even if they do not continue on to graduate school.

While there are always BSAE students who participate in one sort of Honors program or another (e.g. Compute-Based Honors), none have felt the need to participate in AEM Honors.

**M 16: Number of Undergrauates Involved in Faculty Research**

Number of undergraduate students involved in faculty research.

Source of Evidence: Academic direct measure of learning - other

**Target:**
No Target

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

For the past 2 years, the number of undergraduates involved in faculty research:

2010-2011: 10
2011-2012: 13

While not all students involved in faculty research are seniors, the numbers of involved students represents a sizable fraction of numbers of BSAE graduates for the last 3 years (14, 18, 15).

This is an acceptable participation rate.

**SLO 2: Knowledge of Profession**

(Discipline Knowledge) BSAE graduates will have an understanding of the aerospace industry and an appreciation of their professional responsibilities.

**Connected Documents**

3-year FE Results Summaries
BSAE Curriculum Map #1
BSAE Curriculum Map #2

**Related Measures**

**M 1: Senior Performance on FE Exam**

Student performance in related areas of the Fundamentals of Engineering (FE) exams required in their senior year.

**Caveats:**

1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) "Other Disciplines" examination. There is no FE exam especially for AEs since aerospace activity is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator group, there is no guarantee that the FE exam is taken by ALL BSAE seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

**Results:**

1. Pass Rate: shows steady decline, though still above 80%, over the last 3 years. The last year was the first
year that UA pass rate went below the other comparison groups.
2. Computers: shows consistent performance above 80% exceeding comparison groups
3. Engineering Mechanics: shows fluctuations, while still largely in line with comparison groups, also shows decline relative to comparison groups.
4. Thermal Science: Shows similar trends as comparison groups, though declines relative to them.
5. Profession (Ethics): Shows consistent performance above 80% that is higher or on par with comparison groups.

Source of Evidence: Academic direct measure of learning - other

Connected Document
3-year FE Results Summaries

Target:
No Target

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

**Caveats:**
1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) "Other Disciplines" examination. There is no FE exam especially for AEs since aerospace is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator, there is no guarantee that the FE exam is taken by ALL seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

**Results:**
1. Profession (Ethics): Shows consistent performance above 80% that is higher or on par with comparison groups.

Connected Document
3-year FE Results Summaries

**M 3: Senior Performance on FE Exam**

Student performance in related areas of the Fundamentals of Engineering (FE) exams required in their senior year

Source of Evidence: Academic direct measure of learning - other

Connected Document
3-year FE Results Summaries

Target:
No Target

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

**Caveats:**
1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) "Other Disciplines" examination. There is no FE exam especially for AEs since aerospace is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator, there is no guarantee that the FE exam is taken by ALL seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

**Results:**
1. Profession (Ethics): Shows consistent performance above 80% that is higher or on par with comparison groups.

Connected Document
3-year FE Results Summaries

**M 4: Professional Responsibilities**

Familiarization with their professional responsibilities (e.g. ethics).

Source of Evidence: Academic direct measure of learning - other

Connected Document
3-year FE Results Summaries

Target:
No Target

Connected Document
3-year FE Results Summaries

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

Results from the Alabama Fundamentals of Engineering (FE) "Other Disciplines" examination (required of ALL
BSAE seniors) shows consistent performance above 80% that is higher or on par with comparison groups.

**SLO 3: Conceptualize/Analyze/Design Aerospace Systems**
(Skills/Abilities) BSAE graduates will be able to conceptualize, design, and analyze aerospace systems.

**Connected Documents**
- ABET Outcomes - Coverage and Importance
- BSAE Curriculum Map #1
- BSAE Curriculum Map #2

**Related Measures**

**M 5: Senior Design Courses**
Student performance in Senior Design course sequence
Source of Evidence: Performance (recital, exhibit, science project)

**Connected Documents**
- BSAE Curriculum Map #1
- BSAE Curriculum Map #2

**Target:**
Develop designs of vehicles, systems, and innovative approaches.

**Finding (2011-2012) - Target: Met**
2010 - 1 Team: Design, Build, Fly (DBF) competition ... first successful airplane from UA to enter competition

2011 - 2 Teams: #1-DBF - competition entered; #2-Autonomous Vehicle - unsuccessful attempt, though several useful testing techniques developed ...

2012 - 2 Teams: ...
#1-DBF: competition entered and Mission 1 completed (http://www.youtube.com/watch?v=unWmPBtyxKo&feature=results_main&spvgyx=1&list=PLE24912459355757AK), tornado in Wichita ended competition prematurely; ... All DBF missions successfully completed back in Tuscaloosa (http://www.youtube.com/watch?v=ds8CzdLVSo and http://www.youtube.com/watch?v=4EEI6FRwD) plus airplane served as a test bed for team #2's instrument package (see link below); ...
#2-Undergraduate Student Launch Initiative (USLI) - team not selected for competition, rockets launched at a rocketry gathering in Tennessee (http://www.youtube.com/watch?feature=endscreen&NR=1&v=SBByiAi88ho and http://www.youtube.com/watch?v=3MVnaTNlWQY&feature=relmfu), dynamic measurement instruments tested on team #1's airplane (http://www.youtube.com/watch?v=GTF7qweY), but not incorporated into rockets

**M 6: Design Content in Courses**
Course content incorporating design
Source of Evidence: Academic direct measure of learning - other

**Connected Documents**
- ABET Outcomes - Coverage and Importance
- BSAE Curriculum Map #1
- BSAE Curriculum Map #2

**Target:**
Match actual course coverage with faculty-perceived importance

**Connected Document**
- ABET Outcomes - Coverage and Importance

**Finding (2011-2012) - Target: Partially Met**
In the Spring of 2011, a comparison was done of faculty-perceived importance (determined by survey) of the a-m ABET outcomes for the BSAE program to the actual coverage done in 15 BSAE-only courses from the Spring 2009 and Fall of 2010. This was a periodic review of the BSAE degree program as required by ABET.

It was found that there was some discrepancy between the importance and coverage of ABET outcomes:

b) an ability to design and conduct experiments, as well as to analyze and interpret data and

m) proficiency in the design process to include performing tradeoffs and achieving compromises necessary to meet stated design objectives covering a broad spectrum of the topics enumerated in (I).

... (where: I a knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and stability and control.)

In the ensuing period before the next evaluation, faculty have the opportunity to remedy the disparity.

Another such assessment is to be done in the Spring of 2013 before the ABET accreditation visit.

**Connected Document**
- ABET Outcomes - Coverage and Importance

**SLO 4: Computational Solutions**
(Skills/Abilities) BSAE graduates will be able to develop algorithms and use modern computational mechanics and simulation software to solve aerospace engineering problems.

**Connected Documents**
- 3-year FE Results Summaries
- BSAE Curriculum Map #1
- BSAE Curriculum Map #2

**Related Measures**
M 1: Senior Performance on FE Exam
Student performance in related areas of the Fundamentals of Engineering (FE) exams required in their senior year.

Caveats:
1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) "Other Disciplines" examination. There is no FE exam especially for AEs since aerospace activity is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator group, there is no guarantee that the FE exam is taken by ALL BSAE seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

Results:
1. Pass Rate: shows steady decline, though still above 80%, over the last 3 years. The last year was the first year that UA pass rate went below the other comparison groups.
2. Computers: shows consistent performance above 80% exceeding comparison groups
3. Engineering Mechanics: show fluctuations, while still largely in line with comparison groups, also shows decline relative to comparison groups.
4. Thermal Science: Shows similar trends as comparison groups, though declines relative to them.
5. Profession (Ethics): Shows consistent performance above 80% that is higher or on par with comparison groups.

Source of Evidence: Academic direct measure of learning - other

Connected Document
3-year FE Results Summaries

Target:
No Target

Finding (2011-2012) - Target: Met

Caveats:
1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) "Other Disciplines" examination. There is no FE exam especially for AEs since aerospace is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator, there is no guarantee that the FE exam is taken by ALL seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

Results:
1. Computers: shows consistent performance above 80% exceeding comparison groups

Connected Document
3-year FE Results Summaries

M 7: Computer Programming
Course content requiring computer programming and software usage skills

Source of Evidence: Academic direct measure of learning - other

Connected Documents
3-year FE Results Summaries
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Target:
No Target

Finding (2011-2012) - Target: Met

Computer programming is considered an essential skill in the aerospace engineering profession. Accordingly, computer programming and usage is emphasized in the BSAE program.

Courses requiring programming in C++ or FORTRAN:
AEM 249: Algorithm Development and Implementation
AEM 349: Engineering Analysis

Courses requiring developing solution algorithms using other computer software:
AEM 368: Flight Dynamics and Control I (EXCEL, MATLAB)
AEM 468: Flight Dynamics and Control II (MATLAB)

Courses requiring use of specialized software:
AEM 461: Computational Methods for Aerospace Structures (Finite Element Analysis software)

Courses requiring computer resources as needed:
AEM 402 and 404: Senior design course sequence (various: EXCEL; MOTOCALC; ROCKSIM; MATLAB; device-specific software; etc.)
M 8: Senior Performance on FE Exam
Student performance in pertinent area of the Fundamentals of Engineering (FE) exams required in their senior year
Source of Evidence: Academic direct measure of learning - other
Connected Document
3-year FE Results Summaries

Target:
No Target
Finding (2011-2012) - Target: Met
Caveats:
1. ALL BSAE seniors are required to take the Alabama Fundamentals of Engineering (FE) "Other Disciplines" examination. There is no FE exam especially for AEs since aerospace is regulated at the federal, not state, level.
2. BSAE senior classes are generally fairly small compared to the number of students taking the exams nationally and in the Carnegie Comparator groups. This will tend to magnify the statistical influence of only one student.
3. Nationally and within the Carnegie Comparator, there is no guarantee that the FE exam is taken by ALL seniors. Thus the comparison groups are likely self-selecting. They still provide a benchmark.

Results:
1. Computers: shows consistent performance above 80% exceeding comparison groups

Connected Document
3-year FE Results Summaries

SLO 5: An Improvement Outcome
(An Improvement Outcome Derived from the 2010-11 Assessment Findings) Improve design knowledge and skills, and understanding of basic mechanics underpinnings of the aerospace stem areas (aerodynamics, structures, dynamics & control)

Related Measures

M 9: Assessment of percentage design content
Assessment of percentage design content in BSAE curriculum
Source of Evidence: Academic direct measure of learning - other
Connected Documents
ABET Outcomes - Coverage and Importance
BSAE Curriculum Map #1
BSAE Curriculum Map #2

Target:
Assess as part of the ABET program assessment cycle: 4th and 6th years
Connected Document
ABET Outcomes - Coverage and Importance
Finding (2011-2012) - Target: Met
Assessment done in 4th year of current ABET cycle. 6th year not yet reached.

Connected Document
ABET Outcomes - Coverage and Importance

M 10: Improve FE exam pass rate
Improvement in pass rate of the FE examination
Source of Evidence: Academic direct measure of learning - other
Connected Document
3-year FE Results Summaries

Target:
2011-2012: Establish baseline trend
Finding (2011-2012) - Target: Met
Baseline trend established

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

OthOtcn 6: Recognized quality
The program will improve and sustain a high level of recognized quality.
Connected Documents
BSAE Graduate Placement
Participation of BSAE Students in University Scholars Program

Related Measures

M 2: Participation on Enhanced Academic Activities
Participation in: AEM Honors, University Scholars, Faculty Research
Source of Evidence: Academic direct measure of learning - other
Connected Documents
BSAE Honors Program
BSAE University Scholars Program
Participation of BSAE Students in University Scholars Program

Target:
No Target

Connected Document
Participation of BSAE Students in University Scholars Program

Finding (2011-2012) - Target: Met
Participation in the University Scholars program has grown since it began. ... The students clearly see
the value (increased post-graduation options and greater discipline knowledge) of this program enhancement
as demonstrated by the growing participation. Also, the high correlation between participation and graduate
school acceptance shows the program value in graduate school preparation. ......

Undergraduate involvement in research:
2010-2011 = 10;
2011-2012 = 11 ......

Scholarly works(co)authored by Undergraduates: (posters at conferences, papers at conferences and
journals, other) ...
2010-2011 = 12;
2011-2012 = 4 ....

M 11: External Measures
External measures (e.g. FE exam, ABET accreditation)
Source of Evidence: Academic indirect indicator of learning - other

Connected Document
3-year FE Results Summaries

Target:
1. Show good performance of seniors on the Fundamentals of Engineering (FE) Examination in pertinent areas
2. Maintain ABET accreditation

Connected Document
3-year FE Results Summaries

Finding (2011-2012) - Target: Met
1. Good performance of seniors on FE examination demonstrated.
2. ABET accreditation maintained through last cycle.

Connected Document
3-year FE Results Summaries

M 12: Career placement of graduates
Career placement of graduates
Source of Evidence: Academic indirect indicator of learning - other

Target:
No Target

Connected Document
BSAE Graduate Placement

Finding (2011-2012) - Target: Met
See Supplied chart (pdf): While "unknown" outcomes cannot be interpreted (if graduates tell us nothing, we
can't know), BSAE graduates have been able to find placement in either graduate school or non-academic
employment. These show that entities that are in a position to CHOOSE whether or not to accept AEM's BSAE
graduates choose to accept a large percentage of them. This is interpreted as (external) recognition of the
quality of AEM's BSAE graduates.

Connected Document
BSAE Graduate Placement

OthOtcn 7: Optimal level
The program will build and sustain an optimal level of annual program enrollments and degree completions.

Related Measures

M 13: Annual graduation rates
Annual graduation rates
Source of Evidence: Academic indirect indicator of learning - other

Target:
ACHe requires a 5-year average of 7 graduates

Finding (2011-2012) - Target: Met
2007-2008: 9
2008-2009: 11
2009-2010: 14
2010-2011: 19
2011-2012: 14 (as of May 2012)
5 year avg. 13.4 exceeds ACHe requirement

M 14: Enrollment trends
Enrollment trends
Source of Evidence: Academic indirect indicator of learning - other
Target:
Sufficient to sustain required graduation rate

**Finding (2011-2012) - Target: Met**
BSAE enrollments of Spring semesters in each year:

- 2005: 83
- 2006: 112
- 2007: 129
- 2008: 142
- 2009: 120
- 2010: 158
- 2011: 183
- 2012: 159

Enrollments rates are sufficient to sustain the required graduation rate.

**OthOtcm 8: Program value**
The program will be highly valued by its program graduates and other key constituencies it serves

**Connected Documents**
- BSAE Graduate Placement
- Senior Program Satisfaction (EBI data)

**Related Measures**

**M 12: Career placement of graduates**
Career placement of graduates
Source of Evidence: Academic indirect indicator of learning - other

**Target:**
No Target

**Connected Document**
- BSAE Graduate Placement

**Finding (2011-2012) - Target: Met**
See supplied chart (pdf): While "unknown" outcomes cannot be interpreted (if graduates tell us nothing, we can't know), BSAE graduates have been able to find placement with either graduate school or non-academic employment. These data show that AEM's BSAE graduates are able to find placement after graduation to begin or further careers. This result indicates that the program has value to the graduates.

**M 15: Senior/Alumnae Interviews/Surveys**
Satisfaction indicated in Senior Interviews/Alumnae Feedback
Source of Evidence: Academic indirect indicator of learning - other

**Connected Document**
- Senior Program Satisfaction (EBI data)

**Target:**
No Target

**Connected Document**
- Senior Program Satisfaction (EBI data)

**Finding (2011-2012) - Target: Met**
EBI rating scale is 1-7: Program satisfaction fluctuates, but slightly better than recent comparison groups (no data for previous 2 years).
Fundamentals of Engineering (FE) Examination Results Charts

1. General pass rate
   2009-2010  15 examinees
   2010-2011  16 examinees
   2011-2012  17 examinees

2. Computers

3. Engineering Mechanics
   a. Statics
   b. Dynamics
   c. Strength of Materials
   d. Fluid Mechanics
   e. Fluids (PM exam)
   f. Applied Engineering Mechanics (PM exam)

4. Thermal Sciences
   a. Thermodynamics
   b. Thermodynamics and Heat Transfer (PM exam)

5. Ethics and Business Practices

6. Mathematics
   a. Mathematics
   b. Advanced Engineering Mathematics (PM exam)
### Curriculum Maps #2 (What assessment measures will be employed in which courses for each SLO)

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Learning Outcome 1</th>
<th>Student Learning Outcome 2</th>
<th>Student Learning Outcome 3</th>
<th>Student Learning Outcome 4</th>
<th>Student Learning Outcome 5</th>
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<td>AEM 495 (f-j)</td>
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Optional Additional Narrative: Use this space to provide any additional detail concerning the 2011-12 Department Assessment Plan

**BSAE Assessment:**

The BSAE program is accredited by the Accreditation Board for Engineering and Technology every 6 years. The student learning outcomes for the BSAE curriculum are regularly evaluated using the program outcomes defined by the AEM department’s ABET assessment plan. The ABET program outcomes, a through m, are listed below in Table 1 as they relate to the student learning outcomes. The relationship between the ABET Program Outcomes and the professional curriculum is shown in Table 2, below.

At the end of each semester, the faculty submit course reports detailing the ABET Program Outcome content designed into each course. The curriculum itself and the degree of ABET Program Outcome content in the curriculum are re-evaluated according to the assessment cycle shown in Table 3. AEM is presently in the 4th year of this cycle.
Table 1. Relationship of Student Learning Outcomes to ABET Program Outcomes

<table>
<thead>
<tr>
<th>ABET Program Outcomes</th>
<th>Student Learning Outcomes</th>
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<tbody>
<tr>
<td></td>
<td>1</td>
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<tr>
<td>a) an ability to apply knowledge of mathematics, science, and engineering</td>
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<td>b) an ability to design and conduct experiments, as well as to analyze and interpret data</td>
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<td>c) an ability to design a system, component, or process to meet desired goals</td>
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<td>d) an ability to function on multi-disciplinary teams</td>
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<td>e) an ability to identify, formulate, and solve engineering problems</td>
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<td>f) an understanding of professional and ethical responsibility</td>
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<td>g) an ability to communicate effectively</td>
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<td>h) the broad education necessary to understand the impact of engineering solutions in a global and societal context</td>
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<td>i) a recognition of the need for, and an ability to engage in life-long learning</td>
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<td>j) a knowledge of contemporary issues</td>
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<td>k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
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<tr>
<td>l) a knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and stability and control</td>
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<tr>
<td>m) proficiency in the design process to include performing tradeoffs and achieving compromises necessary to meet stated design objectives covering a broad spectrum of the topics enumerated in (l)</td>
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Table 2. Relationship of BSAE Professional Courses to ABET Program Outcomes

<table>
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<th>313</th>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>m)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<td>✔</td>
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</table>
### Table 3. BSAE ABET Program Outcomes Assessment Cycle

<table>
<thead>
<tr>
<th>ACTIONS FOR IMPROVEMENTS</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation and Assessment of AE Courses</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Evaluation and Assessment of AE Curriculum</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Evaluation and Assessment of Mission, Objectives, Outcomes</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Accreditation Visit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Course Examples, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Draft Self-study report</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Complete Self-study report</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Course</td>
<td>Student Learning Outcome 1 (a,c,e,h,j,l,m)</td>
<td>Student Learning Outcome 2 (c-j,m)</td>
<td>Student Learning Outcome 3 (b,c,d,k,m)</td>
<td>Student Learning Outcome 4 (a,b,e,g,k,m)</td>
<td>Student Learning Outcome 5</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------</td>
<td>----------------------------------</td>
<td>--------------------------------------</td>
<td>----------------------------------------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>Course 1 AEM 121 (a,b,d,e,f,g,j,l)</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>✓</td>
<td></td>
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<tr>
<td>Course 2 AEM 249 (a,b,c,e,k)</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>✓</td>
<td></td>
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<tr>
<td>Course 3 AEM 313 (a,e,k,l)</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
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<td>Course 4 AEM 341 (a,e,k,l)</td>
<td>3</td>
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<td>Course 5 AEM 349 (a,c,e,g,l,k)</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>✓</td>
<td></td>
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<td>Course 6 AEM 368 (a,c,e,g,k,m)</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 7 AEM 402 (a-m)</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 8 AEM 404 (a-m)</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 9 AEM 408 (a,b,l,m)</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 10 AEM 413 (a,b,e,g,k,l)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 11 AEM 451 (a-e,g,k-m)</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 12 AEM 461 (a,c,e,k,l)</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 13 AEM 468 (a-c,e,g,k-m)</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Course 14 AEM 495 (f-j)</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

* See Additional Narrative in BSAE Curriculum Map #2
HONORS PROGRAM

The Department of Aerospace Engineering and Mechanics (AEM) Honors Program is part of the College of Engineering Honors Program (COEHP). It is designed to challenge exceptionally talented students with an enriched educational experience. Students completing the AE Honors Program will be awarded a certificate and recognized at the Honors Day Ceremony in the student’s senior year.

Participation in the University Honors Program, (http://honors.ua.edu/uhp/), is recommended but not a requirement. It is also possible for a student in the AEM Honors Program to participate in the AEM University Scholars Program, http://aem.eng.ua.edu/undergraduate_programs/scholar.pdf.

Eligibility:

1. Must be an aerospace engineering student
2. Must apply to the program
3. Current UA students must have a minimum 3.3 GPA. Freshmen and transfer students must have a minimum 3.3 GPA on a 4.0 scale and an ACT score of 28 or SAT score of 1240. Students not meeting this requirement may enter the program after they achieve a 3.3 GPA at the University.

Honors students must maintain a minimum 3.3 GPA to remain in the AE Honors Program.

AE Honors Program Requirements

Eighteen (18) hours of honors credits are required, as follows

- Honors Courses (12 hours minimum) – May include GES 145 and either approved AEM graduate or 400 level courses taken as Honors-by-Contract. 3 of the 12 hours must be “experienced-based” (see below).
  - Approved graduate courses:
    - AEM 500 – Advanced Fluid Mechanics
    - AEM 525 – Spacecraft Dyn. & Control
    - AEM 528 – Space Propulsion
    - AEM 552 – Composite Materials
    - AEM 567 – Fundamentals of Orbital Mechanics
    - AEM 570 – Vibrations
    - AEM 571 – Acoustics
    - AEM 574 – Structural Dynamics
    - AEM 575 – Control Sys. Analysis
  - 400-Level AEM courses taken as Honors-by-Contract, require completion of work deemed by the instructor to be more advanced than the usual course content. The honors agreement must be established before the course begins. The “experienced-based” requirement may be met by AEM 491 or AEM 492 by arrangement with AEM faculty.

- Other Honors Classes (6 hours minimum) – these may include additional AEM honors courses, CBH classes, UHP, or IHP courses. If these 6 hours are designated UHP courses, the student will be recognized as completing UHP as well as COEHP requirements.

Contact

Dr. Thomas Zeiler, Undergraduate Program Coordinator, (205)348-7305, tzeiler@coe.eng.ua.edu
The AEM Department’s University Scholars Program allows AE students to complete the requirements for both a BS in aerospace engineering and an MS in either aerospace engineering or engineering science and mechanics in a five-year period. The University Scholars Program allows for dual (graduate and undergraduate) course credit. Typically, six hours earned at the senior level (senior technical electives) are also counted towards the MS degree in either aerospace engineering or engineering science and mechanics.1

Following successful completion of all requirements for the BSAE, students in the University Scholars program are awarded the undergraduate degree. Students then continue taking graduate courses until the requirements for the MS degree are met. Students in the University Scholars Program are classified as undergraduates until they complete all of the requirements for the undergraduate degree. They cannot hold graduate assistantships until they are classified as graduate students. At that time, University Scholars become eligible for graduate fellowships and scholarships.

Eligibility

Students are normally admitted to the AEM Scholars Program at the end of their junior year. To be considered for admission, BSAE students must:

a) meet the minimum GPA requirement for the University Scholars Program as set by the Graduate School (currently, 3.3);

b) be a senior (presently, this means having completed 94 hours towards the BSAE or having fewer than 32 hours remaining);

c) have completed three-quarters of the total hours required for the BSAE degree and any minor, minimum of 94 (as applicable);

d) have completed all of the University core curriculum requirements; and

e) have submitted an application to the Graduate School.

The graduate catalog describes The University Scholars Program in general. The above requirements are consistent with ‘Phase II’ admission into the program.2

---

1 Students not in the University Scholars Program who have a minimum GPA of 3.0 can take graduate courses for graduate credit (but not dual credit) in their senior year.

2 Phase I admission is “by invitation of the department and the Dean of the Graduate School.” Students apply for Phase I admission at the end of their sophomore year, but courses counted for dual credit are not taken until they are in Phase II of the program. Phase II admission is not contingent on Phase I admission. Further details on Phase I can be found in the Graduate Catalog.
Coursework
The essential differences between the curriculum for the BSAE and the curriculum followed by a student in the University Scholars Program is:

- Two of the AEM electives taken in the senior year are taken for dual graduate and undergraduate credit (see list of courses below).

At the end of the ‘senior’ year, then, University Scholars Program students will have completed the requirements for the BSAE and earned 6 units towards their MS degree. Then, as graduate students:

- Three approved graduate courses are taken in the summer after the senior year.
- Three approved graduate courses are then completed in each of the spring and fall semesters of the fifth year.

Note that the graduate coursework must satisfy the requirements of MS in AE or ESM, which include 3 core courses and 2 mathematics courses (15 units), as specified in the graduate catalog and [http://aem.eng.ua.edu/graduate/](http://aem.eng.ua.edu/graduate/).

AE Electives Eligible for Dual Credit
Any approved 400 level AE elective can be taken for dual credit, but the Graduate School permits a maximum of six (6) semester hours of 400-level course work to be applied to a graduate degree. Furthermore, additional work is required for a 400 level course to count for graduate credit and a form must be completed and submitted to the graduate school before taking the course (see [http://graduate.ua.edu/academics/forms/approve_400.pdf](http://graduate.ua.edu/academics/forms/approve_400.pdf)).

With prior approval from the AEM University Scholars Program Coordinator and the Department Head, the following graduate courses, listed by graduate degree specialization, may be used to meet the AE elective requirements toward the BSAE:

**Aerodynamics and Propulsion**
- AEM 514 – Experimental Aerodynamics
- AEM 516 – Helicopter Theory
- AEM 528 – Space Propulsion
- AEM 571 – Acoustics

**Flight Vehicle Structures and Materials**
- AEM 546 – Intermediate Solid Mechanics
- AEM 552 – Composites Materials
- AEM 570 – Mechanical Vibrations
- AEM 574 – Structural Dynamics

**Flight Dynamics, Simulation and Controls**
- AEM 525 – Spacecraft Dynamics
- AEM 562 – Intermediate Dynamics
AEM 567 – Fundamentals of Orbital Mechanics
AEM 577 – Advanced Linear Control

Additionally, by arrangement with a faculty member, students may pursue special topics (or special projects) courses. These appear as AEM 591 (or AEM 594) in published course schedules but are not open for enrollment without prior arrangement with the instructor. Special topics (or projects) courses can be added to the schedule up until the last day to add a course.

Students interested in the AEM University Scholars Program should contact the Undergraduate Program Coordinator, Dr. Thomas A. Zeiler (tzeiler@eng.ua.edu), or the Department Head.

Tables 1 – 6 show sample AEM University Scholar course schedules starting from the junior year and continuing through an MSAE or MSESM degree.

**Table 1. Typical BSAE curriculum, third and fourth years**

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Spring</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEM 313</td>
<td>AEM 368</td>
<td>AEM 402</td>
<td>AEM 451</td>
<td></td>
</tr>
<tr>
<td>Aerodynamics I</td>
<td>Flight Dynamics I</td>
<td>Aero Design I</td>
<td>Structural Design/Test</td>
<td></td>
</tr>
<tr>
<td>AEM 413</td>
<td>AEM 408</td>
<td>AEM 468</td>
<td>AEM Elective</td>
<td></td>
</tr>
<tr>
<td>Aerodynamics II</td>
<td>Propulsion</td>
<td>Flight Dynamics II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEM 341</td>
<td>AEM 461</td>
<td>AEM 495</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aircraft Structures</td>
<td>Computational Struct.</td>
<td>Senior Seminar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEM 349</td>
<td>HU/L/FA Elective</td>
<td>AEM Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Analysis</td>
<td></td>
<td>HI/SB Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 215</td>
<td>HI/SB Elective</td>
<td>AEM Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermo</td>
<td>HU/L/FA Elective</td>
<td>HI/SB Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HU/L/FA Elective</td>
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<td>HU/L/FA Elective</td>
<td></td>
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<tr>
<td></td>
<td>16 hours</td>
<td>15 hours</td>
<td>16 hours</td>
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</table>

ver 8/18/2011
**Table 2.** Typical AEM University Scholars curriculum, third and fourth years

<table>
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<tr>
<th>Year 3</th>
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<th>Year 4</th>
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<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>AEM 313</td>
<td>AEM 368</td>
<td>AEM 402</td>
<td>AEM 404</td>
</tr>
<tr>
<td>Aerodynamics I</td>
<td>Flight Dynamics I</td>
<td>Aero Design I</td>
<td>Aero Design II</td>
</tr>
<tr>
<td>AEM 413</td>
<td>AEM 408</td>
<td>AEM 451</td>
<td></td>
</tr>
<tr>
<td>Aerodynamics II</td>
<td>Propulsion</td>
<td></td>
<td>Structural Design/Test</td>
</tr>
<tr>
<td>AEM 341</td>
<td>AEM 461</td>
<td>AEM 468</td>
<td>Approved Grad Elective</td>
</tr>
<tr>
<td>Aircraft Structures</td>
<td>Computational Struct.</td>
<td>Flight Dynamics II</td>
<td>(Dual Credit)</td>
</tr>
<tr>
<td>AEM 349</td>
<td>HU/L/FA Elective</td>
<td>AEM 495</td>
<td>HI/SB Elective</td>
</tr>
<tr>
<td>Engineering Analysis</td>
<td></td>
<td>Senior Seminar</td>
<td></td>
</tr>
<tr>
<td>ME 215 Thermo</td>
<td></td>
<td>Approved Grad Elective</td>
<td>HI/SB Elective</td>
</tr>
<tr>
<td>HU/L/FA Elective</td>
<td></td>
<td></td>
<td>HU/L/FA Elective</td>
</tr>
<tr>
<td><strong>16 hours</strong></td>
<td><strong>15 hours</strong></td>
<td><strong>15 hours (3 grad)</strong></td>
<td><strong>16 hours (3 grad)</strong></td>
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</table>

**Table 3.** Typical AEM University Scholars curriculum, fifth year for MS-Plan I in AE

<table>
<thead>
<tr>
<th>Year 5</th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Summer</strong></td>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>AEM 599</td>
<td>AEM 635</td>
<td>AEM 500</td>
<td></td>
</tr>
<tr>
<td>Thesis Research</td>
<td>FEA</td>
<td>Intermediate Fluids</td>
<td></td>
</tr>
<tr>
<td>AEM 599</td>
<td>Approved Math Elective</td>
<td>AEM 668</td>
<td></td>
</tr>
<tr>
<td>Thesis Research</td>
<td></td>
<td>Advanced Flight Dyn</td>
<td></td>
</tr>
<tr>
<td>GES 554 PDEs</td>
<td>Approved Grad Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9 Hours</strong></td>
<td><strong>9 Hours</strong></td>
<td><strong>6 Hours</strong></td>
<td></td>
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</tbody>
</table>

**Table 4.** Typical AEM University Scholars curriculum, fifth year for MS-Plan II in AE

<table>
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<tr>
<th>Year 5</th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summer</strong></td>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>GES 554 PDEs</td>
<td>AEM 635</td>
<td>AEM 500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FEA</td>
<td>Intermediate Fluids</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>Approved Math Elective</td>
<td>AEM 668</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>Advanced Flight Dyn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>Approved Grad Elective</td>
<td>Approved Grad Elective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approved Grad Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9 Hours</strong></td>
<td><strong>12 Hours</strong></td>
<td><strong>9 Hours</strong></td>
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</tr>
</tbody>
</table>

ver 8/18/2011
Table 5. Typical AEM University Scholars curriculum, fifth year for MS-Plan I in ESM

<table>
<thead>
<tr>
<th>Year 5</th>
<th>Summer</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>AEM 599 Thesis Research</td>
<td>AEM 562 Intermediate Dynamics</td>
<td>AEM 500 Intermediate Fluids</td>
</tr>
<tr>
<td>Fall</td>
<td>Approved Math Elective</td>
<td>Approved Grad Elective</td>
<td>Approved Grad Elective</td>
</tr>
<tr>
<td>Spring</td>
<td>9 Hours</td>
<td>9 Hours</td>
<td>6 Hours</td>
</tr>
</tbody>
</table>

Table 6. Typical AEM University Scholars curriculum, fifth year for MS-Plan II in ESM

<table>
<thead>
<tr>
<th>Year 5</th>
<th>Summer</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>GES 554 PDEs</td>
<td>AEM 562 Intermediate Dynamics</td>
<td>AEM 500 Intermediate Fluids</td>
</tr>
<tr>
<td>Fall</td>
<td>Approved Math Elective</td>
<td>Approved Grad Elective</td>
<td>Approved Grad Elective</td>
</tr>
<tr>
<td>Spring</td>
<td>9 Hours</td>
<td>9 Hours</td>
<td>6 Hours</td>
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</table>
### BSAE ABET Program Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>an ability to apply knowledge of mathematics, science, and engineering</td>
</tr>
<tr>
<td>b</td>
<td>an ability to design and conduct experiments, as well as to analyze and interpret data</td>
</tr>
<tr>
<td>c</td>
<td>an ability to design a system, component, or process to meet desired goals</td>
</tr>
<tr>
<td>d</td>
<td>an ability to function on multi-disciplinary teams</td>
</tr>
<tr>
<td>e</td>
<td>an ability to identify, formulate, and solve engineering problems</td>
</tr>
<tr>
<td>f</td>
<td>an understanding of professional and ethical responsibility</td>
</tr>
<tr>
<td>g</td>
<td>an ability to communicate effectively</td>
</tr>
<tr>
<td>h</td>
<td>the broad education necessary to understand the impact of engineering solutions in a global and societal context</td>
</tr>
<tr>
<td>i</td>
<td>a recognition of the need for, and an ability to engage in life-long learning</td>
</tr>
<tr>
<td>j</td>
<td>a knowledge of contemporary issues</td>
</tr>
<tr>
<td>k</td>
<td>an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
</tr>
<tr>
<td>l</td>
<td>a knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and stability and control.</td>
</tr>
<tr>
<td>m</td>
<td>proficiency in the design process to include performing tradeoffs and achieving compromises necessary to meet stated design objectives covering a broad spectrum of the topics enumerated in (l).</td>
</tr>
</tbody>
</table>

#### Coverage vs. Importance

![Coverage vs. Importance Graph](image)

- **Coverage**
- **Importance**

**Faculty Opinion (10 out of 12 Responding) of Relative Importance and Actual Coverage of ABET Outcomes in BSAE Professional Curriculum**

0.077 = 1/13 is the value for uniform content across all outcomes, of which there are 13
Program Satisfaction
(Senior classes, EBI Educational Benchmarking Data)
Some graduates fall under Graduate School and Employment simultaneously.

*Some graduates fall under Graduate School and Employment simultaneously*
Participation of BSAE Graduates in University Scholars Program

Note: No non-participants chose graduate school except for 1 in 2010