

A Status Report on the ABET Accreditation of AE Undergraduate Program

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Background

- The School of AE was reviewed by the ABET Accreditation Board in the Fall of 1997 under Criteria 2000.
- Our self-study report may be found at:
[http://www.ae.gatech.edu/
undergraduate/abet97.pdf](http://www.ae.gatech.edu/undergraduate/abet97.pdf)
- We will be reviewed again in the Fall of 2002.

ABET Review Timetable

- ABET Self-Study Questionnaire will be released around January 2002.
- Report based on questionnaire will be prepared by the AE faculty in Spring 2002.
- ABET will receive the report in the Summer of 2002.
- There will be an on-site review by ABET visitor in Fall 2002.
- ABET accreditation decision will be announced in late fall, or January 2003 at the latest.

What is in the ABET Self-Study Report?

- Some boiler plate material
 - Faculty vitae, teaching loads
 - Course outlines
 - Sample transcripts
 - Description of facilities, class rooms, labs
 - Financial reports, etc.
- Our educational objectives and expected outcomes (student skill set).
- Assessment processes that are in place to ensure that these expected outcomes are indeed being achieved.

Educational Objectives and Expected Outcomes

- We periodically review these in consultation with our constituencies:
 - Faculty
 - Students
 - Employers
 - Alumni
 - External Advisory Councils (you!)
- The present objectives and expected outcomes were established in 1997.
- We are seeking your advice on how these should be modified.

Educational Objectives

- To provide students with a comprehensive education that includes in-depth instruction in aerodynamics, aircraft and spacecraft structures (including structural dynamics and aeroelasticity), flight and orbital mechanics and controls, propulsion and combustion, and design of aerospace systems.
- To prepare students for careers in A.E. by emphasizing the aerospace vehicle, analysis and problem-solving; providing methods to deal with open-ended problems and design, including costs, manufacturing, and maintenance; fostering teamwork, communications skills, and individual professionalism.
- To provide adequate research and independent study opportunities that cultivate lifelong learning skills and nourish creative talents.

Expected Outcomes

- The graduates of the undergraduate program in aerospace engineering will have an understanding of physics, chemistry and mathematics, and how they pertain to solving real world problems.
- They will have a firm understanding of engineering science fundamentals that enables the graduates to examine real world problems for the underlying physical principles, and decide on appropriate methods of solution.
- They will have the ability to analyze and design aerospace structural elements such as trusses, beams and thin walled structures.
- They will have the ability to analyze and design airfoils and wings, accounting for viscous and compressibility effects.

Expected Outcomes (Continued..)

- They will have the ability to analyze and design air-breathing and rocket propulsion systems.
- They will have the ability to analyze the flight and structural dynamics of aircraft and spacecraft, and design flight control systems.
- They will have the ability to work in teams and design complex systems such as aircraft and spacecraft, from a preliminary design perspective.
- They will have good oral, written and graphical communication skills.
- They will be well trained in the role of the engineer in society, and have an awareness of ethical, environmental and quality concerns in the engineering profession.
- They will be trained to be life-long learners, pursuing and interested in independent study, research and development.

We need your advice on..

- Our expected outcomes
 - Are these skills sufficient to be a successful professional in the aerospace field?
 - Are there areas we should emphasize more, or less?
 - Should we look at branched tracks at the undergraduate level, perhaps sacrificing breadth for the sake of depth?
 - Are these skills what you would look for in your own employees, colleagues, and students?

Assessment Issues

- ABET gives us great latitude in establishing our educational objectives and expected outcomes.
- They want to know
 - Are the students achieving these goals?
 - What methods do we use for assessing it?
 - How are we using the assessment results to improve the educational processes?
- Prof. Yeung will discuss these issues.

Assessment Instruments in Use

- Internal Assessment
- External Assessment
- Student Self-Assessment

Internal Assessment

- Performance in exams, homework assignments, written and oral presentations.
- Evaluation of material learned in earlier courses by upper level course instructors.
- Evaluation of student's knowledge and capabilities by
 - capstone design instructors
 - faculty mentors directing student participation in design competitions
 - undergraduate research advisors.

How do we collect the internal assessment data?

- Discipline groups meet periodically (once a semester) to review the student work.
- Entrance exams are given at the start of upper level courses on course pre-requisites.
- An e-mail log of suggestions by upper level course instructors, capstone design instructors, and undergraduate research advisors is kept, and periodically reviewed by the Discipline Chairs.

Improvements to the Curriculum based on Internal Assessment

- 3-D dynamics, and orbital mechanics topics have been added to the foundation courses.
- Math prerequisites for some courses have been modified, to ensure the students are well prepared to handle the math.
- In some cases, the courses have been completely revised to streamline and aid the learning process.
- A technical communication course has been added to the curriculum.

External Assessment

- We collect data on
 - Student team performance in national design competitions
 - Student performance in professional society technical sessions (e.g. AIAA Student Paper Competitions)
 - Student Honors and Awards
 - Benchmark comparisons with peer institutions
 - Alumni surveys
 - Employer surveys
 - Co-Op Employer surveys

Actions Taken Based on External Assessments

- We have increased “Design Build Fly” course offerings, and in the areas of information technology and avionics.
- We have increased opportunities to perform undergraduate study and research.
- We are emphasizing oral and written communication skills more, particularly in our lab and design courses.

Student Self-Assessment Senior Exit Survey

- 55% of the seniors (28 out of 51) participated in the survey.
- In the future, we will attach the questionnaire to the degree petition to encourage participation.
- Students filled out a questionnaire, and participated in free-form oral discussions.
- The survey was administered by the Institute Assessment “Czar”. Faculty were not present.

Student Self-Assessment of their Attainment of AE Program Goals (on scale of 1 to 4)

• Ability to	2000	2001
– apply knowledge of mathematics	3.77	3.63
– apply knowledge of physics	3.69	3.70
– apply knowledge of chemistry	2.54	2.48
– identify and formulate engineering problems	3.92	3.63
– formulate alternative solutions to engg. problems	3.31	3.44
– formulate alternative solutions to engg. testing	3.08	3.15
– design a system/component/process to user needs	3.31	3.00
– apply modern tools for engineering practice	3.31	2.93
– understand societal impact of engineering solutions	2.69	2.19
– understand environmental impact of engg. solutions	2.54	2.15
– produce written reports regarding technical topics	3.69	3.37
– deliver oral reports regarding technical topics	3.00	3.00

Students Level of Satisfaction (Scale of 1 to 4)

	2000	2001
• Adequacy of curriculum for professional needs	2.93	2.93
• Availability of elective offerings	2.38	1.81
• Adequacy of prerequisite courses	2.92	2.59

Oral Comments

- Analytical skills better learned than laboratory skills. Independent research least so
- Strength of faculty often cited. However some seen to be disinterested or showing not enough ``respect" to students
- Faculty preference to engage in research, over teaching or students
- Lack of elective courses, especially in astronautics or space-related subjects
- Students want to see extended hours in AE computer lab, and more opportunities to learn computer programming
- Inadequate training in ethics/environmental issues

Actions taken or Proposed to Address Student Concerns

- We have Implemented improvements to academic advising
- We initiated new faculty search in Avionics, and Space Technology. Avionics professor was hired as a Lockheed-Martin Chair.
- Key-card access to AE is being implemented, and should allow expanded access to Computer Lab and student lounge.
- Computer science courses are now allowed to satisfy science elective requirements.
- LCC 3401 (Technical Communication Practices) is being required.
- Expanded elective offerings are now available in avionics, design, UAV, independent studies.

Concluding Remarks

- We are getting ready for a major review of our program by ABET.
- We solicit your advice on modifying and fine-tuning our expected outcomes.
- We solicit your advice on innovative ways of assessing our program.
- We solicit your advice on what other actions may be taken by us to address student concerns.