

THE UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING
STUDENT OUTCOMES ASSESSMENT

College of Engineering Academic Programs

- | | |
|---|--|
| 1. Aerospace Engineering | www.engin.umich.edu/dept/aero |
| 2. Chemical Engineering | www.engin.umich.edu/dept/cheme |
| 3. Civil & Environmental Engineering | www.engin.umich.edu/dept/cee |
| 4. Computer Engineering | www.eecs.umich.edu/eecs/abet/abeT-cse.html |
| 5. Electrical Engineering & Computer Science | www.eecs.umich.edu |
| 6. Industrial & Operations Engineering | www.engin.umich.edu/dept/ioe |
| 7. Materials Science & Engineering | http://msewww.engin.umich.edu |
| 8. Mechanical Engineering & Applied Mechanics | www.engin.umich.edu/dept/meam |
| 9. Naval Architecture & Marine Engineering | www.engin.umich.edu/dept/name |
| 10. Nuclear Engineering & Radiological Sciences | www.engin.umich.edu/dept/nuclear |

1. AEROSPACE ENGINEERING

1.1 Program Outcomes and Their Relation to Educational Objectives and ABET Outcomes

The outcomes we desire are that graduates of the University of Michigan Aerospace program demonstrate:

- 6 An ability to apply knowledge of mathematics, science, and engineering
- 7 An ability to design and conduct experiments, as well as to analyze and interpret data
- 8 An ability to design a system, component or process to meet desired needs
- 9 An ability to function on multi-disciplinary teams
- 10 An ability to identify, formulate, and solve engineering problems
- 11 An understanding of professional and ethical responsibility
- 12 An ability to communicate effectively
- 13 The broad education necessary to understand the impact of engineering solutions in a global and societal context
- 14 A recognition of the need for, and an ability to engage in life-long learning
- 15 A knowledge of contemporary issues
- 16 An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- 17 A knowledge of aerodynamics, aerospace materials, structures, aircraft and rocket propulsion, flight mechanics, orbital mechanics, aircraft stability and control, and spacecraft attitude determination and control
- 18 Competence in the integration of aerospace science and engineering topics and their application in aerospace vehicle design

Educational objectives:

1. Educate students in the following fundamental disciplines of aerospace engineering and how to apply them: aerodynamics, aerospace materials, structures, aircraft and rocket propulsion, flight mechanics, orbital mechanics, aircraft stability and control, and spacecraft attitude determination and control.
2. Educate students in the methodology and tools of design, the basics of structural design, and the synthesis of fundamental aerospace disciplines necessary to carry out the design of an aerospace vehicle.
3. Educate students in the basics of instrumentation and measurement, laboratory techniques, and how to design and conduct experiments.
4. Help students learn to function on multi-disciplinary teams, and provide them with teamwork experiences throughout their curriculum.
5. Help students learn to communicate effectively.
6. Expose students to environmental, ethical and contemporary issues in aerospace engineering.
7. Expose students to other disciplines of engineering beyond the aerospace field.

The outcomes listed above were chosen as a set that encompassed the outcomes required by

ABET, and were consistent with our educational objectives. The process by which they were chosen is described in Section 1.7. The mapping of our program outcomes to the ABET required outcomes is shown in Figure 1.1. Each of the first 11 program outcomes corresponds directly to one of the ABET Criterion 3 required outcomes. Outcomes 12 and 13 encompass the outcomes specific to an Aerospace program. The topics listed in outcome 12 were chosen by the faculty, to be consistent with Educational Objective 1. The mapping of the program outcomes to the educational objectives is shown in Figure 1.2

Figure 1.1 Mapping of Program Outcomes to ABET Outcomes

ABET OUTCOMES

	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k	Pr:1a	Pr:1b	Pr:1c	Pr:1d
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															

Figure 1.2. Mapping of Educational Objectives to Program Outcomes

		PROGRAM OUTCOMES												
		1	2	3	4	5	6	7	8	9	10	11	12	13
EDUCATIONAL OBJECTIVES	1													
	2													
	3													
	4													
	5													
	6													
	7													

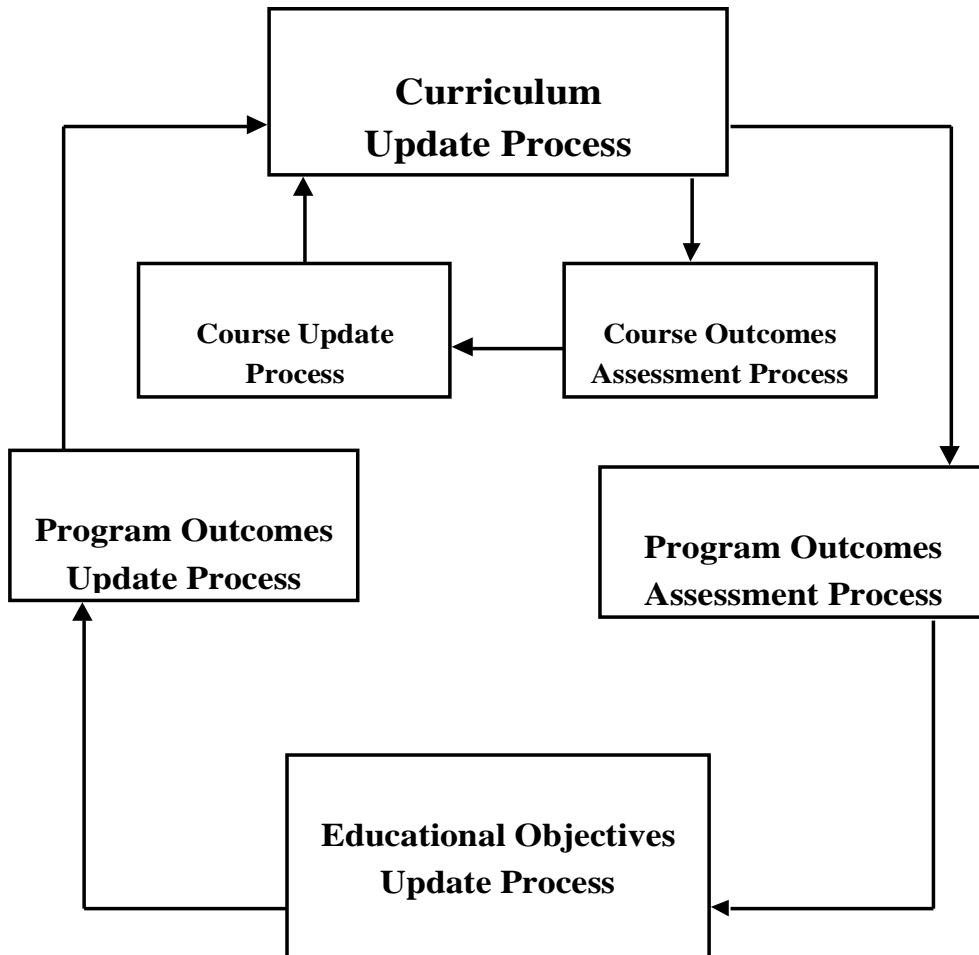
1.2 Overview of Assessment and Improvement Process

The overall processes for program assessment and improvement are shown again in Figure 1.3. The outer loop is the longer-term loop, occurring with a frequency of six years. In the outer loop, the achievement of program outcomes is assessed, and the results are used in updating the educational objectives, program outcomes, and curriculum. The inner loop is the shorter-term loop, occurring with a frequency of one year. In the inner loop, course outcomes are assessed, and individual courses updated.

Results of the course outcomes assessment process feed into the update process for individual courses. Results of the program outcomes assessment process feed into the educational objectives update process. Any changes to the educational objectives result in changes to the program outcomes, which in turn require curriculum changes.

The two assessment processes, and the update processes into which they feed, are described below.

Figure 1.3. Program Assessment and Update Process



1.3 Course Outcomes Assessment Process

The course outcomes assessment process works with data from four sources:

- Student surveys
- Faculty surveys
- Coursework samples
- Student Advisory Committee input

Each source, and the way it is used in the process, is described below.

Student Surveys

Student surveys have been designed to assess students' views of how well a particular course has contributed to the objectives of the program. A survey has been designed for each course in the curriculum, based on the mapping between the desired outcomes of that course and the desired outcomes of the program. The mapping between the outcomes specific to each course and the program outcomes are shown in Figures 1.4 (old curriculum) and 1.5 (new curriculum). For each program outcome that has a strong relationship to a particular course, a question relevant to that outcome has been placed on the survey.

Student surveys are administered every semester, in every course taught. The surveys are administered by the University's Evaluations and Examinations office, with the data for each course reported to the faculty member teaching the course, and the data for all the courses offered by the department reported to the Aerospace Undergraduate Program Committee.