Florida Atlantic University
College of Engineering

Plan of Improvement and Assessment for Undergraduate Engineering Programs (PIA)

1. Preamble

The College of Engineering seeks to provide a superior experience of learning and professional development for its students. Each academic program is designed to impart the specialized knowledge and competencies appropriate to the particular degree, while providing for a broad overview of the discipline area and an appreciation of its relationship to other fields of learning. The College embraces the concept of continuous improvement and has established this improvement and assessment plan as part of this process.

2. The Big Picture

Evolutionary change in the way engineers work is causing colleges of engineering all across the country to re-think their curricula and educational procedures and processes. The collective goal is to have timely, flexible programs of ever-improving quality.

Improvement of quality in the face of rapid change requires an effective system of management and oversight. Clear understanding of program goals and objectives, coupled with assessment procedures to indicate whether established targets are being met, are key elements of such a system.

At the same time, accrediting agencies are embracing continuous quality improvement models for program accreditation. ABET 2000 Accreditation Guidelines require that programs establish performance and educational objectives, that they have a plan for assessment of student learning outcomes, and that there be a well-defined process for review of objectives and outcomes leading to program improvements. The Southern Association of Colleges and Schools (SACS), which accredits all academic programs at Florida Atlantic University, has similar requirements. So does the State of Florida, which performs periodic program reviews.

This Plan of Improvement and Assessment (PIA) has been created to guide the College of Engineering in delivery of high quality educational programs and to assist in alignment of these programs with the requirements of accrediting agencies. Focus is upon undergraduate engineering programs, although many elements of the PIA apply equally well to Computer Science and to graduate programs. Items related to accreditation speak primarily to ABET requirements. Not only is ABET the principal accrediting agency for engineering, but SACS and State requirements tend to be subsets of those of ABET. Appendix D provides a summary of current ABET 2000 accreditation requirements.

3. The Planning Process

Historically, improvement and assessment activities in the College have tended to be ad hoc. Planning to bring structure to the process began in 1997, following the ABET accreditation review the previous fall. Work on a College of Engineering Plan of Improvement and Assessment began officially in July 1999, with establishment of the ABET 2000 Taskforce.

The ABET 2000 Taskforce prepared, and released to the faculty in February 2000, a first draft of the PIA. Dr. Vern Johnson, consultant to the College, reviewed the draft in April 2000. A revised Plan was released to the faculty in October 2000. This revision expanded upon the earlier draft and summarized the results of many months of meetings, discussions, and deliberations by the Taskforce, departmental committees, and College faculty and staff. Approval of the PIA by individual departments was completed in March 2001. This update reflects editorial changes only.

Voluminous materials on the topics of strategic planning, continuous quality improvement, educational objectives, student learning outcomes, and assessment processes were reviewed by the Taskforce. A bibliography of major sources is available from the ABET web site, listed under "Administration" on the College homepage. Four works were found to be particularly helpful and relevant. The Taskforce gratefully acknowledges the help and guidance of these authors:

1. Vern R. Johnson, *A Guide to Planning and Assessing in Support of the Continuing Improvement and Accreditation of Programs in Engineering Education*, College of Engineering and Mines, U. of Arizona, July 1997.

2. M. Dayne Aldridge and Larry D. Benefield, "A Model Assessment Plan", *ASEE PRISM*, May-June 1998, pp. 22-28.

3. Gloria M. Rogers and Jean K. Sando, *Stepping Ahead: An Assessment Plan Development Guide*, Rose-Hulman Institute of Technology, 1996.

4. *How do you Measure Success: Designing Effective Processes for Assessing Engineering Education*, ASEE, 1998.

Recognizing the prominent role of teamwork, innovation and design in the development of engineering students, the ABET 2000 Taskforce also developed a plan to enhance design instruction in the College. Approved by participating departments in March 2000, the plan describes the role of design in the baccalaureate engineering programs of the College of Engineering and outlines the processes and procedures by which students are engaged in this critical educational activity. Provision for collaborative, multidisciplinary capstone projects involving teams of students from different majors, and for capstone projects based on Co-op work assignments, are highlights of the plan. The Taskforce report, *Design in Engineering Curricula*, is available from the College web site.

4. The ABET 2000 Taskforce

The ABET 2000 Taskforce was appointed by the Dean, with input from the Executive Committee. Committee membership includes Chairs and a faculty representative from each baccalaureate program:

CSE - Drs. Alhalabi, Ilyas, Levow
EE - Drs. Raviv, Morgera
ME - Drs. Huang, Salivar
OE - Drs. Ananathkrishnan, Glegg
Chair – Associate Dean Stevens
Ex Officio - Dean Jurewicz
Advisory - Dr. Schlossberg, Shannon Cash

5. The Strategy

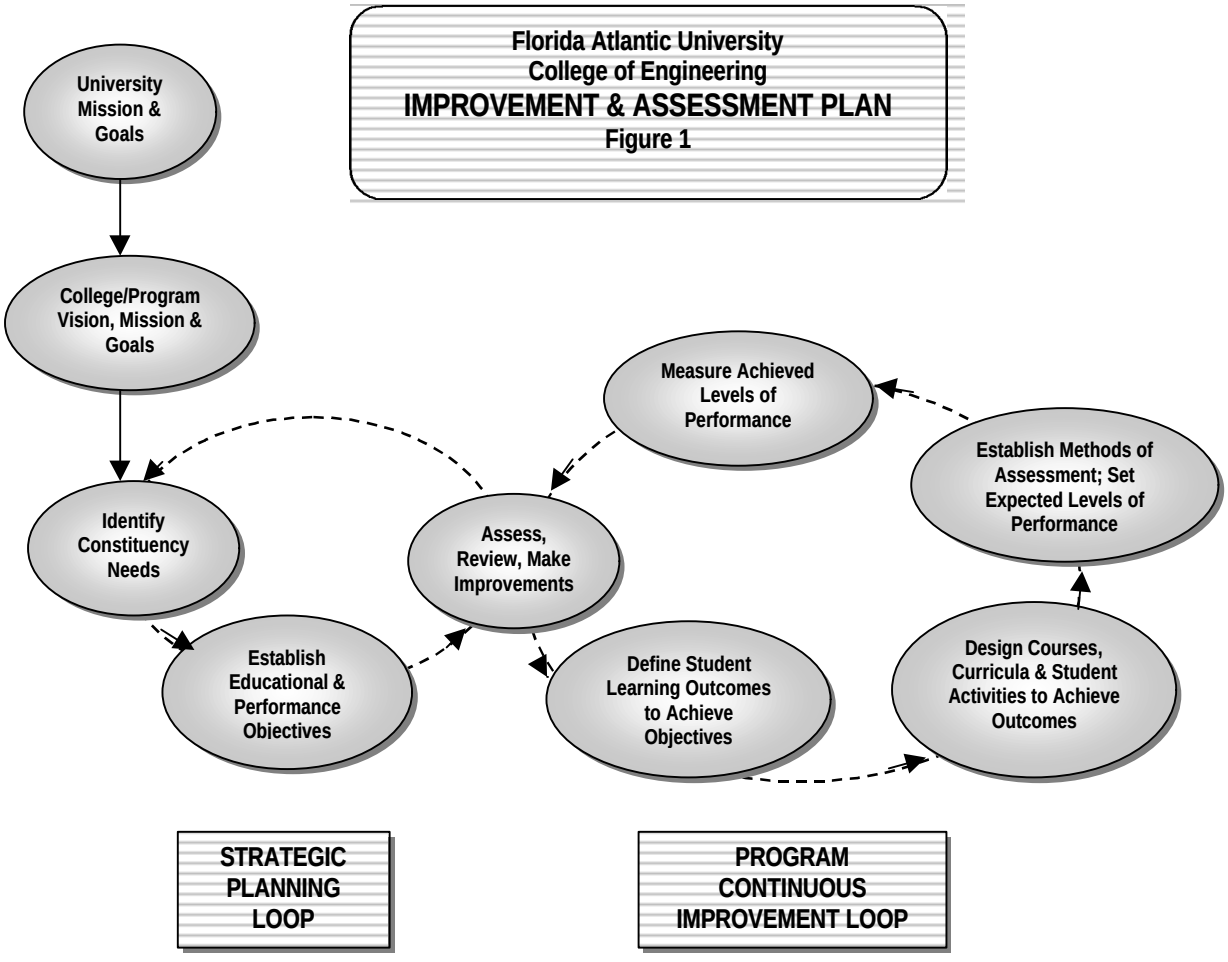
The Taskforce adapted the strategy of developing a core set of plans, processes, and procedures that apply across the College. Departments can add items to meet the special needs and requirements of their individual degree programs, using the core as a convenient template.

Adoption of a single college model of assessment and improvement, with flexibility for implementation by academic programs in ways that meet their specific needs, has many advantages. It minimizes the resources and overall work effort required; it provides a degree of uniformity essential for meaningful interpretation and reporting of assessment results; and it provides a "common look" across programs that facilitates accreditation reviews.

6. PIA Overview

An overview of the Improvement and Assessment Plan is shown schematically in Figure 1. Note that the Plan contains a "strategic planning" loop dealing with objectives and a "continuous improvement" loop dealing with outcomes, courses and curricula. These loops are important parts of the review and improvement process, discussed in Section 18 (page 10).

Individual elements of the PIA are discussed in the following sections. Tasks at both the College and academic program levels are identified. The discussion follows the general order of the "bubbles" on the diagram.



7. Vision, Mission, and Goals

Vision statements describe what an organization aspires to be. Mission statements define what the organization does, whom it serves, and the quality expected. Goals define broad performance priorities. Statements of Vision, Mission, and Goals for the College support fully the Mission and Goals of the University.

University Mission: The University mission statement is broad in scope. Sections with particular relevance to this PIA are included here. The complete mission statement is available at http://www.fau.edu/sacs.

> Florida Atlantic University is a public university committed through its distributed campus structure to providing access to challenging opportunities in higher education for students in Southeast Florida and beyond. Its mission is to serve its region, state, and nation by preparing students to make meaningful contributions in an increasingly complex global society, by encouraging reflection on and evaluation of emerging needs and priorities, and by supporting research and service that enhances economic, human, and cultural development.
>
> FAU accomplishes its mission primarily through its teachers and researchers, its undergraduate educational programs, its graduate and professional offerings, and its linkages to other educational institutions and the community.
>
> Florida Atlantic University prepares its undergraduate students to be productive and thoughtful citizens by offering a broad liberal education coupled with the development of competency in fields of special interest. By providing both disciplinary and multi-disciplinary approaches to the pursuit of knowledge and the solving of problems, FAU encourages students to think creatively and critically and provides intellectual tools needed for lifelong learning. A variety of curricular and extra-curricular opportunities enable students to appreciate the rich diversity that characterizes their region and world.
>
> With its graduate and professional programs, Florida Atlantic University offers advanced education responsive to evolving societal needs. These programs promote original scholarship and basic and applied research, thereby contributing to the new knowledge and approaches needed to respond effectively to complex and critical issues. By working closely with faculty in the classroom, laboratory, studio, and field, students experience first-hand the ways in which knowledge is discovered, applied, and extended.

University Goals: The University strategic plan, *Looking Toward the Future*, lists eight goals. The complete strategic plan is available at http://www.fau.edu/academic/stratplan/.

> GOAL 1: To increase access on each of Florida Atlantic University's partner campuses.
>
> GOAL 2: To provide student support services and other activities that contribute to an exciting and supportive learning environment.
>
> GOAL 3: To encourage curricular and pedagogical innovations responsive to the diverse learning styles, circumstances, and educational needs of Florida Atlantic University's students
>
> GOAL 4: To achieve recognition from local, regional, national, and international constituencies for the excellence of FAU's academic programs
>
> GOAL 5: To enhance graduate education and research
>
> GOAL 6: To expand partnerships with business, government, cultural, and educational institutions
>
> GOAL 7: To promote the academic and organizational integration of FAU's partner campuses
>
> GOAL 8: To develop and allocate resources on the basis of strategic priorities and performance

College of Engineering Vision: The College vision statement is based upon the "Message from the Dean" on the College web page:

> The Florida Atlantic University College of Engineering is committed to providing accessible and responsive programs of education and research recognized nationally for their high quality. We intend to be the institution of choice for regional students, business, and industry. As a community of scholars, we will lead by example and with vision, inspiration, integrity, and a shared sense of purpose. We will promote a stimulating and productive environment of work, study, and scholarly inquiry for students, faculty, and staff.

College of Engineering Mission: The College mission statement is derived from other College publications:

> Through its programs in Engineering and Computer Science, the Florida Atlantic University College of Engineering:
>
> - Educates those who will contribute to the advancement of technical knowledge and who will be the leaders of tomorrow.
> - Conducts basic and applied research in engineering, computer science, and related interdisciplinary areas.
> - Provides service to the engineering and computer science professions, to the State of Florida, to the nation, and to the community at large.

College of Engineering Goals: College goals are derived from the "Message from the Dean" on the College web page:

> Our goals are results-oriented. As a community of scholars, we will:
>
> - Encourage young people to consider careers in engineering and computer science by introducing them to these fields while in middle and high school.
> - Prepare our graduates in ways that provide them a basis for lifelong personal and professional development and that enable them to exercise leadership and make lasting contributions in their disciplines.
> - Continue on new roads of research and discovery in our existing areas of expertise, in emerging disciplines, and in related interdisciplinary areas.
> - Provide the educational resources that working professionals need to keep pace with developments in their field.
> - Magnify our positive impact in serving regional, State, national, and global needs by building mutually beneficial linkages with business, industry, community colleges, K-12 programs and schools, and other constituents.

Program/Departmental Vision, Mission, and Goals: Departmental statements of vision, mission, and goals help describe and promote departmental activities. Each academic program needs to have a simple mission statement that defines its purpose and that distinguishes it from other programs in the Department, College, or University.

8. Identification of Constituency Needs

Principal constituencies served by the baccalaureate programs of the College are students, faculty, alumni, employers, and accrediting agencies. Their needs and interests are input and acted upon in a multitude of ways. Communication links may be as simple as a personal conversation between a faculty member and a student, or as formal as a meeting with an industry advisory committee or an accreditation review.

Departmental and College committees are primary mechanisms for acting upon identified constituency needs.

Interaction with constituencies is an every-day occurrence. Usually, it happens in ad hoc ways. What have been generally lacking are processes for documentation of inputs from key constituencies and for reporting actions taken. Both the College and academic programs need to develop such processes. A form developed by the Taskforce, and available from the College ABET web site, may suffice for these purposes.

College-level input on constituency needs will be obtained in a variety of ways, including:

- The EBI Survey of Graduating Seniors
- The FAU Alumni Survey
- An Annual Meeting with Engineering Student Council
- The COE Co-op Employer Surveys
- The COE Advisory Committee
- College Faculty and Committee Meetings

9. Establishment of Educational Objectives

Objectives provide concrete and measurable steps toward achievement of goals. Establishment of objectives normally follows the process of identification of constituency needs. However, to get the PIA started, the ABET 2000 Taskforce developed an initial set of educational objectives that reflect constituency needs as they currently are known. Academic programs can add items, as needed.

> The baccalaureate experience in the Florida Atlantic University College of Engineering shall provide students:
>
> **A. Preparation for Practice:** Graduates will be prepared for entry-level positions in their discipline and for graduate/professional studies.
>
> **B. Tools for Creativity:** Graduates will experience the creative and design processes and their application to typical engineering situations.
>
> **C. Societal Awareness:** Graduates will receive the breadth of education necessary to integrate practice in their disciplines with the needs and interests of a diverse modern society.
>
> **D. Leadership Skills:** Graduates will be prepared for leadership in their disciplines.

10. Establishment of Performance Objectives

Performance objectives relate to things like enrollments, student retention, student diversity, job placement rates, starting salaries of graduates, etc. They are separate and distinct from educational objectives, but are an important element of the PIA. Performance objectives are discussed in Section 17 (page 10).

11. Define Desired Student Learning Outcomes

Student learning outcomes express educational objectives in terms of student performance. They describe what it is we expect our students to know and be able to do when they graduate. The ABET 2000 Taskforce has developed a core set of learning outcomes. Academic programs can add items, as needed.

> The baccalaureate educational objectives of the Florida Atlantic University College of Engineering will be achieved by insuring that graduates have:

Outcome 1: **An understanding of professional and ethical responsibility.**
Graduates will be familiar with the professional and ethical underpinnings of their discipline and with their professional obligation for continuing education and professional development.

Outcome 2: A working knowledge of fundamentals, engineering tools, and experimental methodologies.
Graduates will have knowledge of math, science and engineering fundamentals. They will be able to combine these basics with their knowledge of experimental methodologies and modern engineering tools to identify, formulate, and solve engineering problems.

Outcome 3: An understanding of the social, economic, and political contexts in which engineers must function.
Graduates will be able to combine their knowledge of the social sciences and humanities with their own personal and professional experiences to demonstrate an understanding of the impact of engineering solutions in an increasingly diverse and technological society.

Outcome 4: An ability to plan and execute an engineering design to meet an identified need.
Graduates will be able to use their knowledge of fundamentals, engineering techniques and tools, and project planning and management to design a system, component, or process that satisfies constraints and meets an identified need.

Outcome 5: An ability to function on multi-disciplinary teams.
Graduates will be able to function effectively on teams using their knowledge of team dynamics, team communication, social norms, and conflict management.

Outcome 6: An ability to communicate effectively.
Graduates will be able to communicate their ideas and results to diverse audiences using their knowledge of written, oral, and graphical communication.

12. Linkages between Objectives, Outcomes, and ABET Requirements

The core learning outcomes support the educational objectives and meet the requirements of ABET Criterion 3 (see Appendix C). Tables 1 and 2 demonstrate the mappings between objectives and outcomes and between outcomes and ABET requirements. Academic programs are responsible for assuring that the necessary linkages are present if different outcomes and objectives are used.

TABLE 1. CORRELATION BETWEEN EDUCATIONAL OBJECTIVES AND STUDENT LEARNING OUTCOMES

	Student Learning Outcomes					
Educational Objectives	1.	2.	3.	4.	5.	6.
A. Preparation for Practice	**6**	6	6	6	6	6
B. Tools for Creativity	8	**6**	8	6	6	6
C. Societal Awareness	8	,	**6**	8	8	8
D. Leadership Skills	**6**	8	**6**	8	6	6

6 Strong Correlation 8 Good Correlation , Little or No Correlation
Mapping Criterion: at least one 6 in each row and column

TABLE 2. CORRELATION BETWEEN STUDENT LEARNING OUTCOMES AND ABET a-k CRITERIA

	ABET Criteria										
Learning Outcomes	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.
1.	,	,	8	8	8	6	8	6	6	8	,
2.	6	6	6	,	6	,	,	8	8	8	6
3.	,	,	6	8	8	8	8	6	8	6	8
4.	8	8	6	6	6	8	6	8	8	6	6
5.	,	,	8	6	8	8	6	8	8	8	8
6.	8	,	8	8	8	8	6	8	8	8	8

6 Strong Correlation 8 Good Correlation , Little or No Correlation

Mapping Criterion: at least one 6 in each row and column

a. an ability to apply knowledge of mathematics, science, and engineering
b. an ability to design and conduct experiments, as well as to analyze and interpret data
c. an ability to design a system, component, or process to meet desired needs
d. an ability to function on multi-disciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global and societal context
i. a recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

13. Course and Curriculum Design

To the faculty falls the task of designing courses, curricula, and student activities to accomplish stated objectives and outcomes. Courses and curricula provide the means by which students obtain the background necessary to assure that educational objectives CAN be achieved. They provide the educational opportunities that enable students to demonstrate that expected levels of learning outcomes ARE achieved. For example, Outcome 6 calls for proficiency in oral and written communication. Where in the curriculum do students obtain education and training in these topics and where do they demonstrate their levels of achievement?

Linkages between the curriculum and learning outcomes need to be stated explicitly. A convenient matrix arrangement for doing this has been developed by Johnson (Reference 1, page 2). This arrangement has the added advantage of helping identify those courses critical to achievement of outcomes. Syllabi for these key courses should indicate clearly the relationship between course activities and the outcome(s) supported.

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14. About Assessment (Evaluation)

Assessment refers to the methods and processes by which one determines whether or not objectives and outcomes are being achieved. Assessment results are used to further program development and improvement and are a key part of the "program continuous improvement loop" and the "strategic planning loop" of the PIA (see page 3). ABET 2000 guidelines require that each academic program have an assessment process with documented results. In simple terms, this process must define what is to be measured, how it is to be measured, and the standards for "success" that will be utilized.

The ABET Taskforce identified and reviewed a wide variety of possible methods of assessment. Those that appeared to hold promise (capstone design evaluations, student portfolios, special student assignments, case studies, nationally-normed exams, etc.) are discussed in Appendix A. The Taskforce also developed, for possible use, a suite of assessment tools (forms) in areas such as Capstone Design, General Design Projects, Oral and Written Communication, Student Teaming, and Employer Surveys (see Appendix B). These forms are available from the College ABET web site (listed on the "administration" menu).

The Dean's Office will assist academic programs by assuming primary responsibility for, and sharing data from, the following assessment activities:

- EBI (Engineering Benchmark Inc.) Survey of Graduating Seniors
- FAU Alumni Survey
- College of Engineering Co-op Employer Survey
- Assessment of college-wide capstone design courses and projects

15. Assessment of Student Learning Outcomes

Assessment of student learning outcomes is a task for academic programs and their faculty. They need to develop an assessment plan detailing the tools, procedures, timelines, and criteria for success that will be used to assess each of their learning outcomes. The plan should indicate what data would be collected, who will collect it, and who will review it. The ABET Taskforce has developed a summary assessment report form for documenting the results obtained (see section 18, Review and Improvement Process).

Each learning outcome should have a primary method of assessment and one or more secondary methods of assessment. Fewer methods of assessment used effectively are better than more methods that generate lots of data that don't get used. A caveat: the core outcomes listed herein are fairly broad; all aspects of the outcome must be covered. For example, the outcome on communication includes oral, written, and graphic communication. Assessments involving only writing would not be sufficient for this outcome.

Assessment of capstone design activities and outcomes is particularly important, since they impact so broadly upon ABET requirements. Student opinion surveys (such as the EBI survey) generally are not appropriate as the primary means of assessment for learning outcomes. They may be suitable as a secondary means of outcome assessment; they are appropriate for assessment of objectives (see Section 16).

16. Assessment of Educational Objectives

Educational objectives are closely linked with learning outcomes (see page 7). Hence, assessment of outcomes provides a high level of assessment of objectives. Inclusion of supplemental assessment data from other independent sources further strengthens the results.

The Dean's Office will be responsible for development and implementation of an assessment plan for the core educational objectives (page 6). Results will be included in the Dean's Office summary assessment report. Academic programs are responsible for insuring that any other objectives they may have are properly assessed and that the results are considered in their program improvement reviews.

17. Performance Objectives and their Assessment

Performance objectives also are an important part of the "strategic planning loop" of the PIA (see page 3). They relate to things like enrollments, student retention, student diversity, job placement rates, starting salaries of graduates, work experience prior to graduation, etc. ABET Criterion 1 requires that student performance be monitored to determine whether objectives are being met.

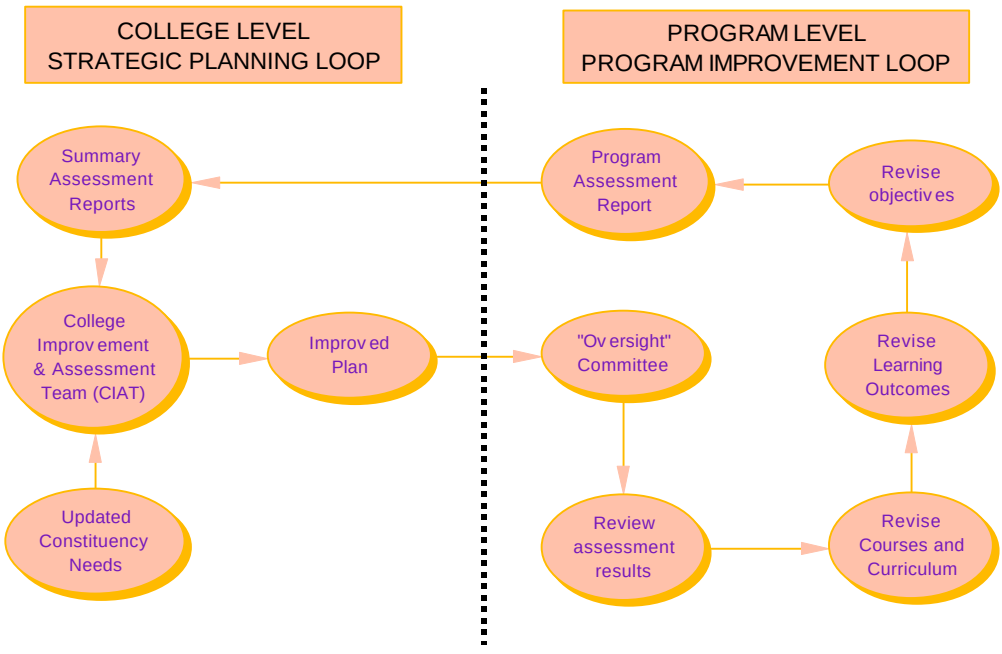
The Dean's Office will develop college Performance Objectives, and a plan for their assessment. Results will be included in summary assessment reports from the Dean's Office. Academic programs are responsible for insuring that any performance objectives they may have are properly assessed and that the results are considered in their program improvement reviews. College and program performance data, such as enrollments and numbers of graduates, are available from the FAU Division of Institutional Effectiveness & Analysis (IEA) at http://iea.fau.edu.

18. Review and Improvement Process

What are the means by which assessment data will be shared, digested, reviewed, and used to make improvements? How will information flow between College and program assessment activities? Who will make recommendations for change and to whom will they be submitted? As noted by Johnson (Reference 1, page 2), "Collecting data does not improve processes. Changes must occur to experience improvement."

The College of Engineering Review and Improvement Process is illustrated schematically in Figure 2. It operates at both the program and college levels, with linkages between. The levels shown are expanded versions of the "strategic planning loop" and the "program improvement loop" of the PIA.

FIGURE 2
FAU COLLEGE OF ENGINEERING
REVIEW & IMPROVEMENT PROCESS



The "program improvement loop" operates at the program level. An "oversight" committee/team designated by the department collects and reviews program assessment data and any updates on constituency needs. It identifies gaps between expectations and achievements, makes recommendations to the department for changes, monitors the changes, and prepares a summary assessment report for the program. A report form prepared by the Taskforce is available from the College Improvement and Assessment web site.

A College Improvement and Assessment Team (CIAT) is responsible for the "strategic planning loop", which operates at the College level. The CIAT has overall responsibility for management and oversight of assessment and improvement activities across the College; it is expected to be a separate standing committee of the College, with faculty and student representation from each academic program. To assure continuity of effort, the ABET 2000 Taskforce will assume the duties of the CIAT until the next ABET review is completed in fall 2002.

Summary assessment reports from academic programs and from the Dean's Office, along with updates on college-level constituency needs, will be submitted to the CIAT for review each fall semester. The PIA will also be reviewed to ensure that it continues to reflect the mission, goals, and objectives of the College and to verify that it is accomplishing its intended purpose of providing a guide for delivery of high quality programs.

A brief status report will be prepared by the CIAT and submitted to the Dean, Chairs, program oversight committees, faculty, Engineering Student Council, and any other relevant groups. This report will provide an "improved" plan of action for the College. It will describe program and College successes in meeting outcomes and objectives, it will identify potential problem areas, it will discuss new or additional resource needs, and it will include recommendations for change. Feedback of information via the status report completes the strategic planning loop.

Constituency needs tend to evolve slowly, so objectives should not require frequent modification. College educational and performance objectives will be reviewed annually until the next ABET review, after which they will be reviewed every three years. Learning outcomes will need to be reviewed more frequently. Changes made as a result of the Review and Improvement Process, whether at the program or College level, need to be documented in a manner convenient for internal use and external review.

19. Improvement and Assessment Plan Tasks

Table 3 provides a summary of tasks involved with the PIA, at both the College and program levels. This summary provides a convenient checklist for measuring progress toward completion and implementation of the Plan.

TABLE 3. IMPROVEMENT & ASSESSMENT PLAN TASKS

Task	Responsible Agent			Notes
	Task force	Prog.	Dean's Office	
Develop College Improvement & Assessment Plan	!			First draft released to faculty in 2/2000; revised plan to faculty 10/2000; departmental approvals 3/2001.
College vision, mission & goals	!			Released to faculty in 2/2000; extensive faculty review in spring 2000.
Program/department vision, mission & goals		!		Mission statements were prepared for SACS assessment plans.
Task	**Responsible Agent**			**Notes**

TABLE 3. IMPROVEMENT & ASSESSMENT PLAN TASKS				
	Task force	**Prog.**	**Dean's Office**	
College plan for gathering, documenting and reporting input on constituency needs			!	Taskforce form available.
Program plan for gathering, documenting and reporting input on constituency needs		!		Taskforce form available
Establish core set of educational objectives	!			Released to faculty in 2/2000; extensive faculty review in spring 2000; revised in summer 2000.
Establish program educational objectives		!		
Establish core set of expected student learning outcomes	!			Released to faculty in 2/2000; extensive faculty review in spring 2000; revised in summer 2000.
Establish student learning outcomes for program		!		
Design courses and curricula to achieve educational objectives and learning outcomes		!		
Document linkages between courses & curricula and learning outcomes		!		Very important.
Prepare syllabi for key courses showing how course activities support learning outcomes		!		Very important.
Set expected performance levels for learning outcomes		!		
Develop plan for assessing learning outcomes		!		Results reported to program "oversight" committee
Develop plan for supplemental assessment of core educational objectives			!	Report summary assessment results to the CIAT.
Develop plan for assessing program educational objectives		!		Results reported to program "oversight" committee
Establish college-level performance objectives	!		!	
Develop assessment plan for college performance objectives	!		!	Report summary assessment results to the CIAT
Establish program performance objectives		!		
Develop assessment plan for program performance objectives		!		Results reported to program "oversight" committee
Develop College review & improvement process	!			
Develop summary assessment report form	!			Available on web site
Designate program review and improvement "oversight" groups		!		
Create CIAT	!	!	!	ABET 2000 Taskforce will serve as CIAT until next ABET review
Develop plan for documentation of college-level changes & improvements made			!	
Develop plan for documentation of program changes & improvements made		!		
Dean's Office Summary Assessment Report			!	Submitted to CIAT; see Table 4
Program Summary Assessment Report		!		Submitted to CIAT; see Table 4
PIA completed and fully Implemented	!	!	!	

20. Summary of Reporting Requirements

All assessment and improvement activities need to be documented. Some results will be used only at the program level; others will be reported to the College Improvement and Assessment Team (CIAT). Table 4 summarizes who reports what to whom and when.

TABLE 4. ASSESSMENT REPORT REQUIREMENTS

Report	By	To	For	Format	Due Date
Supplemental Assessment of Core Educational Objectives	Dean's Office	Programs & CIAT	College Review & Improvement Process	TBD	Fall semester
Assessment of College Performance Objectives	Dean's Office	Programs & CIAT	College Review & Improvement Process	TBD	Fall semester
Assessment of Program Educational Objectives	Program	Program "Oversight Committee"	Program Review & Improvement Process	TBD	As needed
Assessment of Learning Outcomes	Program	Program "Oversight Committee"	Program Review & Improvement Process	TBD	As needed
Summary Assessment of Learning Outcomes	Program "Oversight Committee"	CIAT	College Review & Improvement Process	Taskforce Form	Fall semester
Assessment of Program Performance Objectives	Program	Program "Oversight Committee"	Program Review & Improvement Process	TBD	As needed
College Status Report	CIAT	College Faculty, Students, Staff & Administration	College Review & Improvement Process	TBD	Spring semester

Appendix A: Assessment Tools and Processes

To assist programs in development of their plans for assessment of educational objectives and student learning outcomes, the Taskforce reviewed and evaluated a number of possible assessment tools. These are summarized in the following table, along with comments about each.

General Comments

1. Both outcomes and objectives need to be assessed. If there is a demonstrated "necessary and sufficient" link between the two, assessment of outcomes will assure assessment of objectives.

2. A multi-faceted approach to assessment using different assessment tools is desirable.

3. Each outcome should have a primary method of assessment and one or more secondary methods of assessment. A few methods of assessment used effectively are better than more methods that generate lots of data that don't get used. A caveat: the core outcomes listed herein are fairly broad; all aspects of the outcome must be covered. For example, the outcome on communication includes oral, written, and graphic communication. Three assessments of writing would not cover this outcome.

4. The structure of this PIA suggests an assessment strategy focusing upon capstone design and a select set of courses that involve writing and speaking, ethics, teamwork, etc.

5. Student surveys reflect student opinions. They should not be used as the primary method of outcome assessment. They can be used for assessment of objectives, and may be suitable for secondary assessment of outcomes.

TABLE 5. SOME POSSIBLE ASSESSMENT TOOLS

TOOLS FOR OUTCOMES ASSESSMENT	
Assessment Tool	**Comments**
Capstone design evaluation	Good for assessing all core learning outcomes. Gives comparative data across programs. Assessment form available from ABET web site.
Project/special assignments	A good way to assess "softer" topics such as ethics or contemporary issues. Project can cover more than one outcome if designed properly. Assessment form available from ABET web site.
Teaming evaluation in specific courses	Assessment form available from ABET web site.
Communication evaluation in specific courses	Assessment form available from ABET web site.
Fundamentals of Engineering exam	Excellent for assessment of fundamentals, including ethics and economics; provides performance data by subject and comparative data with other institutions. Cost to student.
Graduate record exam	OK for assessment of fundamentals but provides only an overall score; gives some information on reading comprehension, etc. Cost to student.
Student portfolios	Course portfolios could cover more than one outcome. Longitudinal portfolios (across courses or semester) could focus on a single item, such as writing. Assessment rubric needed. Demonstration of electronic portfolio use is available at http://www.rose-hulman.edu/ira/reps/
Student assessment of team participants	Good for assessing the "teamwork" outcome. Assessment rubric needed.
Prerequisite exams in follow-on courses	Provides excellent opportunity to demonstrate feedback of results for program improvement.
TOOLS FOR ASSESSMENT OF OBJECTIVES	
Assessment Tool	**Comments**
EBI senior survey	Comprehensive data benchmarked against other schools. Also provides longitudinal data. First used in 1999-2000. College pays annual fee.
FAU alumni survey	University administers survey and summarizes and distributes results. First used in spring 2001.
College Employment and Graduate School Survey	Provides information on starting salaries, work experience prior to graduation, and plans for graduate school. College distributes forms and analyzes data. First used for 1999-2000.
Employer surveys	Assessment form available from ABET web site.
Co-op employer evaluations	Assessment form available from ABET web site.
Placement data	Limited data collected by State available from IEA.
Student focus groups	Assessment rubric needed.
Student exit interviews	Assessment rubric needed.

APPENDIX B: ASSESSMENT AND REPORT INSTRUMENTS AND FORMS

The Taskforce has developed a summary assessment report form and a suite of assessment tools (forms) for possible use by academic programs and the Dean's Office. These items are available from the Improvement and Assessment web site, listed under "administration" on the College homepage.

APPENDIX C: ABET 2000 Accreditation Requirements

This summary of ABET 2000 requirements is provided for convenience and ease of reference. Complete documents are available at http://www.abet.org/. Self-Study Instructions for ABET visits, also available from this web site, provide useful information about the review and improvement processes expected

ENGINEERING CRITERIA 2000
Criteria for Accrediting Engineering Programs
Effective for Evaluations during the 2000-2001 Accreditation Cycle

I. GENERAL CRITERIA FOR BASIC LEVEL PROGRAMS
It is the responsibility of the institution seeking accreditation of an engineering program to demonstrate clearly that the program meets the following criteria.

Criterion 1. Students: The quality and performance of the students and graduates are important considerations in the evaluation of an engineering program. The institution must evaluate, advise, and monitor students to determine its success in meeting program objectives. The institution must have and enforce policies for the acceptance of transfer students and for the validation of courses taken for credit elsewhere. The institution must also have and enforce procedures to assure that all students meet all program requirements.

Criterion 2. Program Educational Objectives: Each engineering program for which an institution seeks accreditation or reaccreditation must have in place:
(a) detailed published educational objectives that are consistent with the mission of the institution and these criteria
(b) a process based on the needs of the program's various constituencies in which the objectives are determined and periodically evaluated
(c) a curriculum and processes that ensure the achievement of these objectives
(d) a system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program.

Criterion 3. Program Outcomes and Assessment: Engineering programs must demonstrate that their graduates have:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Each program must have an assessment process with documented results. Evidence must be given that the results are applied to the further development and improvement of the program. The assessment process must demonstrate that the outcomes important to the mission of the institution and the objectives of the program, including those listed above, are being measured. Evidence that may be used includes, but is not limited to the following: student portfolios, including design projects; nationally-normed subject content examinations; alumni surveys that document professional accomplishments and career development activities; employer surveys; and placement data of graduates.

Criterion 4. Professional Component: The professional component requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The engineering faculty must assure that the program curriculum devotes adequate attention and time to each component, consistent with the objectives of the program and institution. Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental;

sustainability; manufacturability; ethical; health and safety; social; and political. The professional component must include
(a) one year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline
(b) one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study
(c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Criterion 5. Faculty: The faculty is the heart of any educational program. The faculty must be of sufficient number; and must have the competencies to cover all of the curricular areas of the program. There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students. The faculty must have sufficient qualifications and must ensure the proper guidance of the program and its evaluation and development. The overall competence of the faculty may be judged by such factors as education, diversity of backgrounds, engineering experience, teaching experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and registration as Professional Engineers.

Criterion 6. Facilities: Classrooms, laboratories, and associated equipment must be adequate to accomplish the program objectives and provide an atmosphere conducive to learning. Appropriate facilities must be available to foster faculty-student interaction and to create a climate that encourages professional development and professional activities. Programs must provide opportunities for students to learn the use of modern engineering tools. Computing and information infrastructures must be in place to support the scholarly activities of the students and faculty and the educational objectives of the institution.

Criterion 7. Institutional Support and Financial Resources: Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering program. Resources must be sufficient to attract, retain, and provide for the continued professional development of a well-qualified faculty. Resources also must be sufficient to acquire, maintain, and operate facilities and equipment appropriate for the engineering program. In addition, support personnel and institutional services must be adequate to meet program needs.

Criterion 8. Program Criteria: Each program must satisfy applicable Program Criteria (if any). Program Criteria provide the specificity needed for interpretation of the basic level criteria as applicable to a given discipline. Requirements stipulated in the Program Criteria are limited to the areas of curricular topics and faculty qualifications. If a program, by virtue of its title, becomes subject to two or more sets of Program Criteria, then that program must satisfy each set of Program Criteria; however, overlapping requirements need to be satisfied only once.

PROGRAM CRITERIA FOR CIVIL AND SIMILARLY NAMED ENGINEERING PROGRAMS
Submitted by the American Society of Civil Engineers

These program criteria apply to engineering programs including "civil" and similar modifiers in their titles.
1. Curriculum
The program must demonstrate that graduates have: proficiency in mathematics through differential equations; probability and statistics; calculus-based physics; and general chemistry; proficiency in a minimum of four (4) recognized major civil engineering areas; the ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the recognized major civil engineering areas; the ability to perform civil engineering design by means of design experiences integrated throughout the professional component of the curriculum; an understanding of professional practice issues such as: procurement of work; bidding versus quality based selection processes; how the design professionals and the construction professions interact to construct a project; the importance of professional licensure and continuing education; and/or other professional practice issues.
2. Faculty
The program must demonstrate that faculty teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience. The program must demonstrate that it is not critically dependent on one individual.

PROGRAM CRITERIA FOR ELECTRICAL, COMPUTER, AND SIMILARLY NAMED ENGINEERING PROGRAMS
Submitted by The Institute of Electrical and Electronics Engineers, Inc.

These program criteria apply to engineering programs that include electrical, electronic, computer, or similar modifiers in their titles.
1. Curriculum

The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program. The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to program objectives. Programs containing the modifier “electrical” in the title must also demonstrate that graduates have a knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics. Programs containing the modifier “computer” in the title must also demonstrate that graduates have a knowledge of discrete mathematics.

PROGRAM CRITERIA FOR MECHANICAL AND SIMILARLY NAMED ENGINEERING PROGRAMS
Submitted by The American Society of Mechanical Engineers

These program criteria will apply to all engineering programs including "mechanical" or similar modifiers in their titles.
1. Curriculum
The program must demonstrate that graduates have: knowledge of chemistry and calculus-based physics with depth in at least one; the ability to apply advanced mathematics through multivariate calculus and differential equations; familiarity with statistics and linear algebra; the ability to work professionally in both thermal and mechanical systems areas including the design and realization of such systems.
2. Faculty
The program must demonstrate that faculty responsible for the upper-level professional program are maintaining currency in their specialty area.

PROGRAM CRITERIA FOR OCEAN AND SIMILARLY NAMED ENGINEERING PROGRAMS
Submitted by the Society of Naval Architects and Marine Engineers (Lead Society in cooperation with the American Society of Civil Engineers and The Institute of Electrical and Electronics Engineers, Inc.)

These program criteria apply to engineering programs including "ocean" and similar modifiers in their titles.
1. Curriculum
The program must demonstrate that graduates have: knowledge and the skills to apply the principles of fluid and solid mechanics, dynamics, hydrostatics, probability and applied statistics, oceanography, water waves, and underwater acoustics to engineering problems; the ability to work in groups to perform engineering design at the system level, integrating multiple technical areas and addressing design optimization.

2. Faculty
Program faculty must have responsibility and sufficient authority to define, revise, implement and achieve the program objectives.