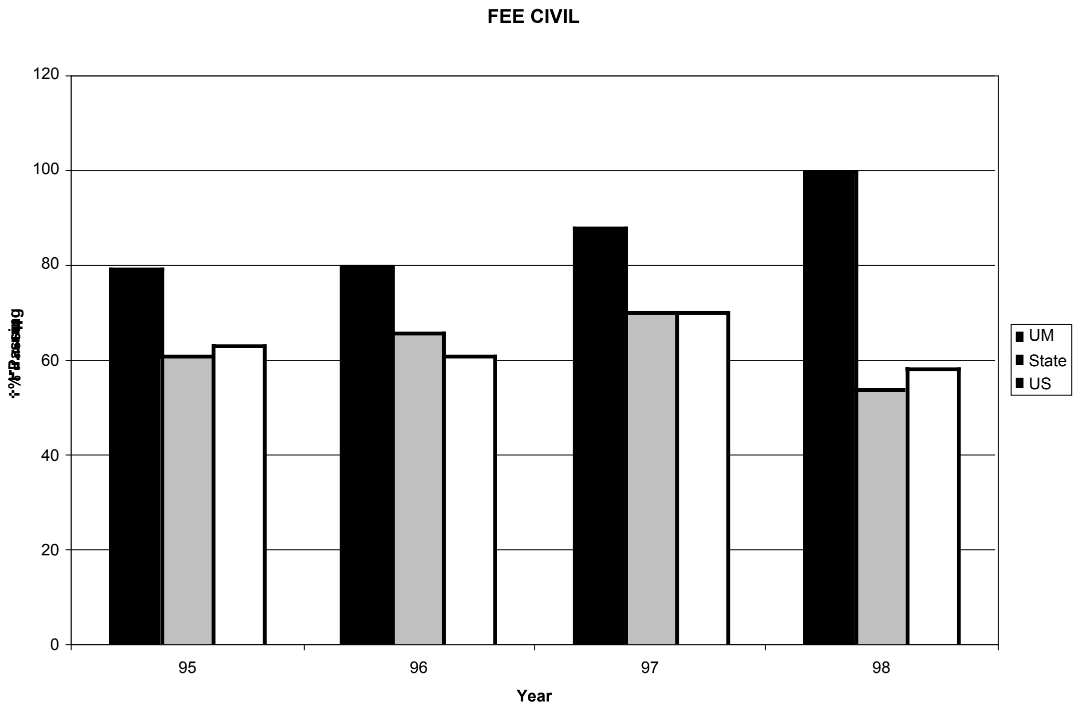
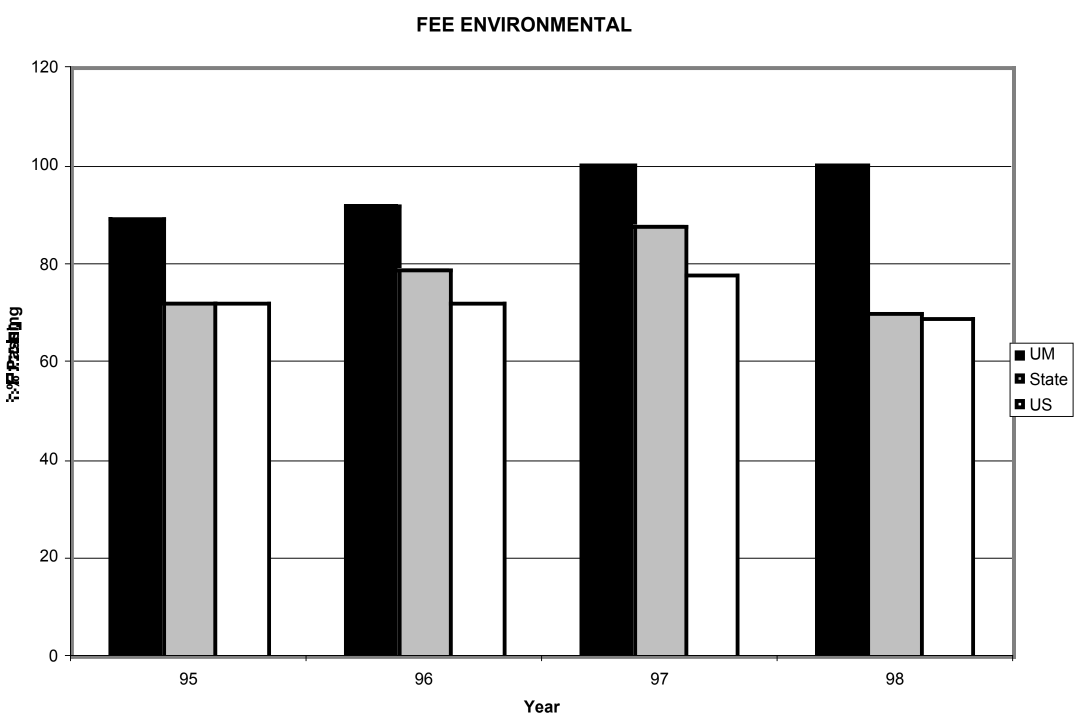
Figure 3.3. Fundamentals of Engineering Examination Results





4. COMPUTER ENGINEERING

Program Assessmnet Plan for the Computer Engineering Undergraduate Degree Program

In the spirit of the EC 2000 approach to engineering accreditation, the program assessment should be focused on developing a process which measures the degree to which the program outcomes meet the our desired program objectives. This assessment process serves the following purposes:

* Provide an in-depth understanding of the extent to which the program implementation achieves the desired outcomes, and

* Suggest possible modifications to the program for improved achievement of the program objectives.

Our program assessment process consists of the following steps:

1. Each course will be evaluated every time it is taught with the goal of assessing the extent to which the course outcomes were achieved. We will average the results of these assessment exercises on course specific outcomes over several offerings of each course. This will reduce semester-to-semester variations as well as variations induced by different instructors. (This averaging process will also ensure that these assessments of course outcomes do not get unduly confused with instructor assessment.) Course assessment tools include content samples such as home-works, exams, and projects; faculty notes on their assessment of the course, and course evaluation forms. A group of cognizant faculty members will be assigned to each course who will be responsible for regular monitoring the health of the course.

2. The various course specific outcomes assessment will be integrated into a matrix of program outcomes. We will also take a random sample of graduating students and assess the extent to which their course work met the desired program outcomes. These findings will be discussed with the student advisory committee, and their input will be solicited.

3. We will conduct periodic surveys of the graduating seniors with the aim of assessing the degree of achievement of program level outcomes. We will also conduct surveys of the alumni and industry employers. The results of these surveys along with the course and program assessments described above will be analyzed by the CSE curriculum committee. The committee will produce an overall analysis of the extent to which the desired program outcomes are being achieved. This will be done on an bi-annual basis. The committee will also present possible changes to the program which may lead to improvements in achieving program outcomes.

4. The analysis and recommendations of the curriculum committee will be

presented to the EECS National Advisory Committee (NAC) which consists of representative members from industry, peer universities, and government. Input and feedback from NAC will be solicited on how the program can be improved.

5. The curriculum committee will analyze this input and combine it with input from SAC and the results of various assessment tools and make recommendations on course and program changes to the EECS faculty (and the CoE faculty) for their approval. The curriculum committee will also document the changes to the courses and the program and associated outcomes.

Approved by Chair of EECS and CSE ABET Representative Nov.13,1998

5. ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Assessment Process: Excerpts from ABET EC2000 Program Self-Study

5.1 Program Educational Objectives

Assessment Process for Program Educational Objectives

This assessment process was presented to and approved by the EE program faculty on November 30, 1998.
Since the assessment procedure has just been put in place, this section focuses on the establishment of the program educational objectives, and on their assessment by the EE program's National Advisory Committee.

Establishment of Program Educational Objectives

The program educational objectives are based on the work of the EE Curriculum Committee over the period 1994-1995. This committee performed an extensive review and evaluation of the EE program, which included assessments of strengths and weaknesses of the program and some comparison with programs at peer institutions. This review and evaluation resulted in the adoption of the extensive changes to the EE program summarized in Part A above. Its findings were presented in a 50-page report presented to the EE program faculty on December 21, 1995.

The educational objectives were presented to the faculty on Sept. 15, 1998. After some minor revisions, they were approved and adopted by the EE program faculty. Subsequently, the educational objectives were approved by the College of Engineering Curriculum Committee and by the College of Engineering faculty.

Constituent Involvement in Review of Program Educational Objectives

Students: The College of Engineering has begun a survey of graduating seniors. The present form of this Senior Survey focuses on program educational outcomes, but this may change over time. In general, we believe at this time that currently enrolled students do not have the perspective to evaluate program objectives (as opposed to program outcomes). A Student Advisory Committee has been established for the EE program, but this did not occur until after the program educational objectives were established;

Faculty: EE program faculty participated in the establishment of the program educational objectives through informal conversation and discussion at faculty meetings. The EE program faculty were required to approve the EE program objectives, as noted above;

Alumni: The College of Engineering has begun to survey alumni of each program several years after graduation. The first survey had a return due date of November 30, 1998, and was targeted at alumni two, five, and ten years after graduation (classes of 1996, 1993, and 1988). The present form of this survey also focuses on program educational outcomes, but this too may change over time. At present, the EE program has received sufficient feedback from its National Advisor Committee (see immediately below). However, the alumni survey has been very useful in addressing program outcomes;

Graduate Schools and Employers: The EE Program has a National Advisory Committee consisting of leaders from peer universities (e.g., M.I.T.) and leading companies (e.g., Motorola, Texas Instruments). The former represent both peer EE programs and graduate schools to which EE program alumni apply; the latter represent employers of EE program alumni. This committee met with various EE program faculty members on May 14-15, 1996, and on April 12, 1999 and submitted reports, which were distributed to the EE program faculty.

5.2 Program Outcome Assessment

<u>Assessment Process for Program Educational Outcomes</u>

This assessment process was presented to and approved by the EE program faculty on November 30, 1998.

Course Assessment Procedure

The heart of the assessment process is the procedure for assessing courses, for the following reasons:

- Courses are by far the most important part of the EE program undergraduate experience;
- Courses are the part of the EE program most amenable to measurement of EE program outcomes. That is, courses require students to perform specific tasks (take exams, work problem sets, write reports, give oral presentations) which can be measured to determine whether EE program outcomes are being measured;
- Courses are the part of the EE program most amenable to change (the feedback gain is strongest).

The course assessment procedure is described in detail in Figure 5.1.

The most important aspects of this course assessment procedure are as follows:

1. At the end of each term, the faculty member teaching each course fills out an ASCII electronic evaluation form that summarizes quickly:

- The faculty member's impressions on how well the course went that term;
- Which topics need to be treated in more (or less) depth;
- How well program outcomes were addressed in the course, and recommendations for any changes.
- A sample form is included in Figure 5.2.

2. Each undergraduate course in the EE program has about three "cognizant faculty" assigned to it. The responsibilities of cognizant faculty are explicitly spelled out in the course assessment procedure (Figure 5.1). Once a year (changed from every term), the cognizant

faculty for each course meet and review how it went. Input is solicited from the following sources:

- The *faculty* member teaching the course (using the electronic form noted above);
- The *students* taking the course (using the University of Michigan course evaluation forms, tailored for the course). The customized student evaluations are a very important assessment tool, and they are discussed in more detail below.

3. Minor changes to the course (1 or 2 lectures worth) are handled within the cognizant faculty for the course. More substantial changes, including to the course outcomes addressed in the course, are relayed to the EE Curriculum Committee. Input from a student advisory committee on the general reputation of the course among the students is also solicited.

4. The EE Curriculum Committee is charged with ensuring that all of the program outcomes are addressed somewhere in the EE program, and in general all inter-(between)-course issues. Significant changes to contents of courses must be approved by the EE program faculty, the College of Engineering Curriculum Committee, and the College of Engineering faculty.

Figures 5.1 and 5.2 were distributed to the EE program faculty in March of 1999. No hard information on the success of this procedure is available at this writing. It should be noted that this is the first formal procedure the EE program has ever had to monitor and assess courses.

_*Course Assessment Measures*

Associated with each course is a set of course objectives and course outcomes. The measures used to assess program outcomes, as well as technical content, *in each course*, are listed on the Step II form for each course. Discussion of some common measures follows:

- **Exam performance:** This may seem trivial, but it is by far the best way of determining just what students can do. Each exam problem is associated with, and addresses, a course outcome. The cognizant faculty for the course can determine how well a course outcome is addressed by examining how the students performed on that problem;

- **Problem sets:** Each problem set problem also addresses a course outcome, and it can be evaluated as above;

- **Project reports:** These provide an excellent way of evaluating course outcomes and the program outcome on technical communication. For EECS 311 (analog circuits) and the senior design courses, project reports will also be evaluated s*eparately* by technical communications faculty, who will evaluate the reports specifically for technical communications content (this procedure is not yet in place).

5.3. Program Outcome Assessment Measures

Course Assessment Procedures and Course Assessment Measures described what bodies (from the bottom up: cognizant faculty; EE Curriculum Committee; EE program faculty) USE assessment data, and the levers (course content) that are pushed by the assessment data. That is, they described the *output* (actuators) of the assessment process.

In this section the *inputs* to the assessment process are described. That is, how do the bodies listed above measure to what extent an EE program outcome is addressed in a course, and in the EE program as a whole? Since this is a much more involved discussion, it is presented after the discussion of how the assessment data are used.

Student Course Evaluations

Student input into the assessment process comes from the evaluation forms they fill out at the end of each term for each course they took that term. These course evaluation forms have a standard basic form throughout the University of Michigan. Students use a #2 pencil to darken a circle under columns ranging from 5=”strongly agree” to 1=”strongly disagree.” The forms are given to a student volunteer in the class, prior to the course evaluation. On the last day of class (usually), the instructor leaves the room, the student volunteer distributes the forms in the class, the students fill them out in class, and the student volunteer collects the completed forms and turns them into the department. Only after grades have been turned in are instructors allowed to see the results, even though the forms are anonymous.

The forms are read by computer and results compiled by the Center for Research on Learning and Teaching (CRLT) of the University of Michigan. Results become available about a month after the evaluation. They are provided to the faculty teaching the course, the department, and the College of Engineering. In addition, they are made available to students on the University of Michigan web page.

Although the student evaluation forms have a standard, university-wide format, the individual questions on the form can be customized for each course. In practice, this was not done in the EE program until 1999, when the EE Program Assessment plan was implemented. Presently, the student evaluation form for each course can be divided into four sections:

· Four questions required by the University of Michigan. The scores for the first two questions are taken very seriously—when faculty in the Dept. of EECS turn in their annual Faculty Activities Report, the first item is the courses taught and the student course evaluation scores for the first two questions. The four questions are:

1. “Overall, this was an excellent course”
2. “Overall, the instructor was an excellent teacher”
3. “I learned a great deal in this course”
4. “I had a strong desire to take this course”

· Six questions required by the College of Engineering. These cover whether the instructor gave clear explanations, acknowledged questions, used class time well, was well-prepared for class, and whether work requirements for the course were clear and appropriate;

- Several questions that address the EE program outcomes. These are specified *directly* by the course-to-program-outcomes matrix shown in Figure 6. For example, if the box at the intersection of the column for EECS 210 and the row for EE program outcome #7 has an X, the question, "This course improved my ability to communicate technical information" will appear on the student evaluation form. There are 2-3 variations on the question wording for each program outcome; in the present example, the question can be chosen to be, "My oral communication skills improved because of this course";

- Several questions that are requested by the faculty teaching the course that term. Usually these are chosen by the cognizant faculty to be appropriate to the course. For example, if the course has a laboratory, several questions about the laboratory will be included. Faculty may also include their own choices.

The cognizant faculty members make use of the course evaluations to do either of the following:

- Increase (or decrease) the emphasis within the course syllabus on the program outcomes; or

- Change the program outcomes addressed by the course (insert or remove Xs from Figure 6).

Senior Survey

The College of Engineering has begun surveying all graduating seniors on a program-by-program basis. This survey focuses primarily on the curriculum for each program. The surveys address the following issues:

- How did various freshman courses prepare you for your engineering courses?

- How much did the curriculum emphasize applications, design, technical communication, teams, ethics, environmental issues, and flexibility? These are Curriculum 2000 issues, not program outcomes specifically, but their relevance to the program outcomes is evident;

- How satisfactory was the department environment (laboratories, computing facilities, faculty contact, student organizations, co-curricular activities, and overall atmosphere);

- Future plans and interests.

This is valuable information, but it only incidentally relates to program outcomes. However, the results of these surveys do provide a diagnostic tool for identifying problems in the program not directly related to program objectives and outcomes; not all of the EE program comes under those headings. For example, if the freshman calculus courses are not preparing students adequately (in the *students'* judgment), either these courses need to be improved or the sophomore EE courses need to start at a lower technical level. If students believe the computer facilities to be inadequate, this is their chance to let the department know, so that more computer labs can be opened (neither of these is actually the case).

Alumni Survey

Alumni of the EE program are now surveyed once a year. The survey covers alumni two, five, and ten years after graduation. The first survey, sent out in 1998, covered alumni of the classes of 1996, 1993, and 1988. Note that the alumni classes covered will vary each year; thus all EE program alumni will have the chance to participate in the survey repeatedly as their professional careers develop.

With regard to program outcomes specifically, these surveys list the EE program outcomes #1-11 (which coincide with ABET program outcomes 3a-3k) and inquire:

- The importance of these program outcomes in their professional experience;
- How well the EE program prepared them in these areas.

There are two main reasons for including these questions:

- To evaluate how well the EE program prepared its alumni in these areas, now that the alumni have some operational, real-world basis on which to judge their preparation. Note in-program students do not have this experience;
- To evaluate the relative significance of the EE program outcomes themselves. While ABET requires an accredited EE program to ensure that all of its graduates satisfy these outcomes, some program outcomes are much more important than others. This came out quite dramatically in the results of the 1998 surveys. This is very valuable in deciding the relative emphasis of program outcomes in the EE program.

Figure 5.1

TO: All Electrical Engineering Program teaching faculty
FROM: Andrew E. Yagle and Pramod Khargonekar

RESPONSIBILITIES OF COGNIZANT FACULTY

At the end of each term (excluding Spring):

I. Each faculty fills out end-of-term course evaluation form (see EECS 210 example).

II. This form is emailed to the other cognizant faculty for that course.
Cognizant faculty members for each course meet and do the following:
a. Review how this term went (faculty evaluation):
i. What topics went badly and require more time?
ii. What went well and may require less time?
iii. How are the textbook, labs, etc.?
b. Review student course evaluations:
What do students say about the course? (especially ABET-related items)
If an ABET topic is not being covered well, need to improve its coverage.
c. Folder of material given to faculty teaching it next term:
End-of-term student and faculty course evaluation forms.
Handouts, exams, course notes from previous term(s).
Step II course forms detailing what course is to accomplish.

III. Prepare a summary to be emailed to the EE/SE Curriculum Committee.
For now, email ASCII file to.
This summary will (hopefully) be a paragraph or so. It should include:
a. Discussion (if any required) of #IIa above.
b. Discussion of what ABET topics were/were not addressed well.
c. Recommendations on revision of ABET topics addressed by course.

IV. The Curriculum Committee will review these and decide whether major course revisions are necessary, whether any material should be moved between courses, etc.
All inter-course material to be handled by Curriculum Committee.

V. Problems may arise (especially initially) on ABET-related items.
i. If a course isn't addressing its ABET items, need to alter these.
ii. But if everyone drops (say) "ethics" or "teams," that isn't acceptable to the curriculum as a whole.
iii. The Curriculum Committee oversees the curriculum as a whole.
They judge where we need to address ABET-related items, in conjunction with cognizant faculty.

VI. If changes in ABET-related items are made in a course,
Student course evaluation forms need to be changed for next term.
The cognizant faculty, NOT the Curriculum Committee,
are responsible for getting these changes to Ruby Sowards (sowards@eecs).

Figure 5.2

ABET END-OF-TERM INSTRUCTOR COURSE EVALUATION FORM

COURSE: EECS 210 TERM: Winter 1998 INSTRUCTOR: A.E. Yagle
****
To be completed by: course instructor at the end of each term.
Return to: cognizant faculty for the course.
****
A. On the following list of topics, do the following:
   a. Put an "X" by topics which students found most difficult.
   b. Put an "O" by topics which students found easiest.
      Add comments on specific aspects of each topic.

X Fourier series: Great difficulty computing coefficients
   Transfer functions and filtering
   KVL, KCL, Ohm's law
O Node equations
X Thevenin and Norton equivalents: (always hard, since more abstract)
   Op amps and dependent sources
XX Complex numbers: any symbolic manipulation
X Phasors and impedance
   Complex power
O Simple Bode magnitude plots
   Other (please specify)
****
B. What specific recommendations do you have for next term
   on allocation of course time to the above topics? Examples:
   More problems, lectures on theory, lectures on examples, lab.

Need more review problems in basic integration and complex numbers.
Insulting to students to spend lecture time on what they should know
****
C. What did students NOT know that they SHOULD have known from course
   prerequisitities?

Integrate a square wave, basic complex numbers, matrix multiplication
****
D. List by number which COURSE outcomes did not go well this term:

2 (difficult ones: 1,3,6,10). Others went very well.

COURSE OUTCOMES:
1. Given a simple circuit (3 nodes) containing resistors, inductors,
   capacitors, ideal op-amps, dependent sources, and sinusoidal voltage

and current sources, be able to compute any current or voltage in the sinusoidal steady state using phasors.
2. Given any simple periodic signal, be able to compute its Fourier series expansion. Be able to set up the integral, even if can't evaluate it.
3. Given the Fourier series expansion of an input signal and a transfer function, be able to compute the Fourier series expansion of the output.
4. Given a simple circuit with an ideal op amp, be able to analyze it and compute the output voltage as a function of the input voltage(s).
5. Given a simple circuit as in #1, be able to compute a transfer function.
6. Given a simple circuit and a simple periodic signal, be able to compute the Fourier series expansion of any voltage or current in steady state.
7. Given a simple transfer function, be able to sketch Bode magnitude plot of its frequency response.
8. Given the Bode magnitude plot of frequency response of a lumped system, be able to compute the transfer function and identify values of circuit elements (simple problems only--assume minimum phase).
9. Given a simple inductor+resistance model of a load, be able to compute power dissipated, power factor, and correct power factor to one by connecting a capacitor in parallel to the load.
10. Given a simple circuit OR two points on its i-v characteristic, be able to compute Thevenin and Norton equivalents, and be able to interpret as ideal sources with internal resistance. Also be able to specify which load draws maximum power from a given circuit using this concept.
11. Be able to analyze, using digital oscilloscopes, meters, and waveform generators, frequency response of simple amplifier and filter circuits.
12. Be able to construct simple amplifier and filter circuits from lab components.

E. Which of the following PROGRAM outcomes were addressed this term? All of the PROGRAM outcomes are listed, including ones not addressed.

1,2,3,11,13

1. An ability to apply knowledge of mathematics, science and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of electrical engineering solutions in a global and societal context
9. A recognition of need for an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills and modern engineering tools

necessary for engineering practice

12. Knowledge of probability and statistics, including applications appropriate to electrical engineering
13. Knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex devices and systems containing hardware and software components, as appropriate to program objectives
14. Knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics

6. INDUSTRIAL AND OPERATIONS ENGINEERING

6. 1. Data Used on a Continuing Basis to Demonstrate Graduates Satisfy Outcomes

We have made great progress on the development of new measures to support the assessments of our students both at the department and college level. As a new process for IOE we have worked hard at designing the process and we are in the early stages of implementation. We spent a great deal of time developing the very best goals, objectives, and outcomes for our program and identifying measures. We implemented significant new measurement systems. We now have a substantial amount of data from the first wave of data collection. The undergraduate program committee met on May 26 to review the data on hand, summarize the trends, and identify opportunities for improvement. These were communicated to the department chair and the next step will be to develop an action plan. Clearly, more input is needed from a variety of constituents before identifying specific courses of action.

The following data sources were examined for this first assessment and planning session:

Senior Survey--This is based on a standardized survey across the college of engineering of graduating seniors conducted in the Fall of 1998. Additional responses were collected in the Winter of 1999 but that data is not yet available so we worked with the Fall data. Results indicated seniors felt there was too much emphasis on engineering science and teamwork and not enough emphasis on engineering applications, engineering design, communications, the environment, ethics, and free electives. Over 90% of students said they would recommend the program to others.

Alumni Survey from graduating cohorts, 1996, 1993, 1998—This was administered by the College of Engineering and provides interesting data on trends across cohorts in different career stages. In addition to the general college of engineering, IOE added a set of specific questions evaluating different curriculum areas within IOE. At this point we do not have the IOE-specific questions analyzed. In addition, this summer we will be collecting complete data from all IOE alumni and consider that data in te Fall of 1999.

One of the most encouraging and important findings from this survey is that ratings of the effectiveness with which the IOE teaches teamwork skills was significantly higher for our 1998 graduates compared to earlier graduates. While 55% of 1988 graduates said IOE provided a good or excellent preparation in "ability to function on a team," 68% of 1993 graduates reported good or excellent preparation. **By 1998, fully 84% of our graduates rated teamwork skills that were provided as good or excellent**. All cohorts rated teamwork skills as among the most important in their professional lives.

Alumni felt there undergraduate preparation was strong for most program outcomes. But substantial numbers felt the program needed to be strengthened in ethics, communication skills, and understanding the broader impacts/issues in engineering.

Employer Survey—The first college of engineering employer survey was conducted in the Winter of 1999 by surveying companies recruiting on campus. Out of 184 companies recruiting, 77 filled out the survey. The survey was designed to measure employer expectations for our graduates, and their assessment of the undergraduate preparation of our students. The sample size was too small to analyze data separately by department. But the data provide an overall sense of what employers value and their assessment of COE graduates.

In all,95.6 percent of employers said they were "satisfied" or "very satisfied" with the performance of U-M College of Engineering B.S.E. graduates. The competencies and attitudes that they rated as most important to their organization were teamwork (94% very important), engineering problem solving skills (79% very important), communication skills (68% very important), math, science and engineering skills (57% very important), appreciation of ethical values (56% very important).

In most cases they rated student preparation in the areas that they thought were the most important for performance of their companies as excellent or very good. For example, 98% rated preparation in math, science, and engineering skills as excellent or very good and 99% rated engineering problem solving skills excellent or very good. Teamwork, which was rated most important, was rated as excellent or very good by 89% of employers). Communication skills look like they could use some work—27% rated this as excellent and 52% as very good.

New Course Evaluations, Fall, 1998 and Winter, 1999—These included the new questions designed to measure our program outcomes established to meet engineering criteria 2000. We only asked those questions appropriate for the particular outcomes of each course.

Most program outcomes got high ratings by the large majority of students. Notable exceptions were communications and ethics which had less satisfactory ratings.

Faculty Self-Assessments for Winter, 1999 Courses—These were self-assessments using forms we piloted for the first time this winter term. Each faculty member filled out their assessment for each of the course outcomes. They looked at exams and other course measures and summarized how students did on different outcomes. They then wrote down what went well and opportunities for improvement. The suggestions for improvements were very valuable. It was also useful in giving faculty an opportunity to reflect on the course outcomes.

There were many very specific suggestions which we will consider, such as adequacy of labs and facilities. A theme across a number of courses was that the large class size made learning less effective.

More data will be coming and reviewed in the near future. Each of the threads have their own assessment methods and these will be reviewed in the Fall.

Graded materials (exams, homework, etc.) are still the primary means by which we ensure that students are learning the course material. Faculty developed tables to relate the specific course outcomes to their various course measures. An example is shown below for one course—IOE 373: information systems. Faculty self-assessments are a way to get faculty to reflect on those graded items and how students have performed on each of the course outcomes. Now that we have identified specific course outcomes and related them to the measures the next step is to encourage faculty to systematically relate grades to the achievement of specific outcomes (e.g., which outcome areas did students have problems with on the midterm and how can this be improved?).

6.2. How Assessment Results are Applied to Further Develop and Improve the Program

We have focused most of our effort in the last year on clearly defining our objectives and intended outcomes for the department and individual courses, as well as developing measures of our effectiveness in achieving these outcomes. We also have spent a great deal of effort in implementing curriculum 2000, which is itself designed to greatly improve our ability to achieve these outcomes.

Applying the assessment results will be an ongoing effort that will never end. We are just at the beginning of doing that and recognize much work needs to be done. The first data has been coming in from our new assessment initiatives and as reported in the previous section the undergraduate program committee has met, reviewed this data, and made general recommendations for areas of improvement.

6.3. Example Changes Implemented to Further Develop and Improve the Program

Curriculum 2000 has been a radical redesign of the IOE program and many changes are already in place. The curriculum threads are about half implemented and address a number of specific program outcomes. Teamwork has been worked on and alumni survey results show significant improvement over time in the skills are graduates feel they are taking away from the program in this area. The new data that we collected this winter has been analyzed and a set of recommendations put forth to the department. We would expect some implementation by the time of the ABET site visit in the Fall.

6.4. Processes and Procedures used for Acceptance of Transfer Students

All enrollment in I.O.E., including transfer students, is handled by the College of Engineering (COE) recruitment office. A detailed description of the rigorous process of accepting transfer students and validating course credit at the college level was described in section B.1: College of Engineering Admissions Process. IOE can provide minimum criteria but the administration of those criteria are handled by COE. Currently there is a minimum grade point average required of 2.7 overall and 2.7 for math and science courses for U.M. students outside of engineering transferring in. For students originating outside U.M. the requirements go up to 3.0 overall and 3.0 for math/science.

6.5. Procedures used to Validate Credit for Courses taken Elsewhere

Any I.O.E. courses for which the student wants credit are validated by the undergraduate program advisor. If he or she has any questions, the cognizant faculty member for the equivalent I.O.E. course will review the syllabus, exams, etc. to see if it covers the core content of the course. In response to the new “Engineering Criteria 2000” we have clear course outcomes which can now be used as criteria for evaluating transfer courses.

Figure 6.1

Development of IOE Objectives and Outcomes