

7.6 Changes That Have Been Implemented

Since 1995, our department has been developing a process to improve our curriculum. This process has evolved to the state that is described in this document. The changes to our undergraduate program have been significant. After our last ABET review, the undergraduate committee decided that it needed to take control of our curriculum. For years, the material that was taught in a course was completely determined by the primary instructor, with no oversight. This meant that each time an instructor changed, the course did too. The undergraduate committee started to take control of the curriculum in 1996 by focussing on our introductory course, Principles of Engineering Materials (MSE 250). This course was a required course for the larger departments in the College. Our department was about to embark on a college wide effort to fundamentally change our undergraduate program, Curriculum 2000 (described earlier). One of the casualties of Curriculum 2000 was that some courses that were previously required by the larger departments in the college, like MSE 250 were going to become electives. Unfortunately, the course was not popular with the students. Owing to its lack of popularity, MSE 250 was in deep trouble. The results of the course evaluation forms had long been recognized as a problem for MSE 250 and the undergraduate committee wanted to respond. We were awarded money through the provost to hold a workshop that would bring together the authors of the introductory textbooks, educational experts, and faculty from MS&E departments across the country, which were leaders and innovators in materials education. The result of this workshop was a completely revamped, objectives based course, which took advantage of many of the innovations presented during the meeting. The timing for this renovation of the course came at a critical point for our department. Our department hired a full time Materials Science Ph.D. whose expertise was in developing technology to enhance teaching. He was immediately brought into our MSE 250 project. We launched our new course in the Fall 1996 term. This course used a Web based approach for the in-class presentation and incorporated a set of in-class demonstrations that had recently been developed. We also applied for a grant to develop in-class feedback tools and peer teaching techniques. Our ratings improved and we started to develop a new following for the course. We expanded our offerings to a second introductory course that focussed on manufacturing, MSE 220, in 1998. This course expanded the web based materials for MSE 250 to create its own web stie. Success can sometimes be measured in numbers. The combined pre-registration numbers for MSE 250 and MSE 220 next fall are close to the 300 students per term that we used to teach.

The institution of curriculum 2000 in the MS&E department has allowed us to make some major changes in our core curriculum. Our old curriculum only required a student to select four courses amongst; physical metallurgy, x-ray methods, electronic, magnetic, and optical properties (EMO), polymers, ceramics and xxx. We now require that all students take a metals, ceramics, polymers, and EMO course. In the past we taught EMO in a one term course without any prerequisite of quantum mechanics or solid state physics. This course ended up being a quantum mechanics and solid state physics course with a little bit of EMO. Our new curriculum has a new course, MSE 242 which covers the Physics of Materials. This is the quantum mechanics and solid state physics that a

student will need understanding EMO and other materials topics. This course also introduces reciprocal space concepts in energy band diagrams and the physics of diffraction in the context of the Fourier Transform. The latter topic addresses the undocumented multitude of comments concerning the lack of advanced mathematics in materials programs.

We have revamped our laboratory courses significantly and changed them from two 2-credit courses to two 4-credit courses where a significant fraction of time will now be spent in lecture and in a computer simulation laboratory. New monies have been allocated to equip these laboratories and the fruits of these efforts can be seen in the facilities section of this self-study. These courses will be launched this next academic year.

Our new curriculum will surely change significantly as we try it out. The ABET process has enabled the undergraduate committee to finish the job of taking control of our curriculum. That is, the institution of cognizant faculty committees for each course will enable the undergraduate committee to distribute the workload amongst the most knowledgeable faculty. For the first time, we have a plan to ensure oversight and assessment of our curriculum.

Most of our assessment tools described in this section have only recently been put in place. As such, we cannot report much progress in closing the loop with results from these measures right now. By the time of the site visit, however, we should see direct results at the course level via the cognizant faculty committees.

7.7 Materials That Will Be Available for Review

The web site will be periodically updated to show the current program. Previous versions will be available which document the changes we have made since this report was written. All assessment data will be made available. This includes the complete alumni and senior survey data, the complete set of faculty and cognizant faculty reports from the Winter 99 term (the first time we have done this), the competency checklists (this is new for the Fall 99 term and we will not have completed ones), and Design projects and presentations. Transcripts and other related information will be available as well.

7.8 Policies Regarding Admission of Transfer Students

Intra-university transfer: Students who have attended another unit on the Ann Arbor Campus of the University of Michigan are considered for admission after one year of study. They must have completed courses that are the equivalent of our freshman year with a minimum grade point average (GPA) of 2.5 for the programs using the base level:

Degree Program	Minimum GPA
Aerospace Engineering	2.8
Chemical Engineering	3.2
Civil & Environmental Engineering	2.5
Computer Engineering	3.0
Electrical Engineering	3.0
Industrial & Operations Engineering	2.7
Materials Science & Engineering	2.5
Mechanical Engineering	3.0
Naval Architecture & Marine Engineering	2.5
Nuclear Engineering & Radiological Sciences	2.5

These courses must include English 125 (Composition), Calculus I and II (if they have Advanced Placement in these courses, the next two math courses); a computer course using C (Engineering 101 or EECS 100); one semester calculus-based Physics and the laboratory; one semester Chemistry and laboratory; and a Humanities or Social Science course.

Combined inter- and intra-university transfer: Students who have attended off-campus colleges plus another unit on the Ann Arbor campus are considered for admission after the completion of the prerequisite courses. They must have completed courses that are the equivalent of our freshman and sophomore years with a minimum GPA of 3.0 for most programs.

Degree Program	Minimum GPA
Aerospace Engineering	3.0
Chemical Engineering	3.4
Civil & Environmental Engineering	3.0
Computer Engineering	3.5
Electrical Engineering	3.5
Industrial & Operations Engineering	3.0
Materials Science & Engineering	3.0
Mechanical Engineering	3.3
Naval Architecture & Marine Engineering	3.0
Nuclear Engineering & Radiological Sciences	3.0

The courses to be completed are: 2 years of mathematics through differential equations; at least 4 hours of Composition; one year of calculus-based Physics and the laboratories; a computer course using C; and the Chemistry necessary for their degree

program. The remaining courses can be either technical or non-technical in nature depending on the offerings available. Grades of B or better are expected in mathematics, chemistry and physics, especially for students attending two-year schools. Foreign students must, in addition, have at least a score of 560 on the TOEFL test or 85 on the English Language Institute Test and evidence of adequate financial backing. A limited number of students may be permitted to transfer to some degree programs.

Foreign university transfer: Foreign students from universities in non-English speaking countries are admitted as transfer students on a highly individual and flexible basis. The level and extent of previous education and performance and the success of previous students from the same university are taken into account. They must show the same proficiency in English and evidence of financial backing as foreign students admitted from American universities.

A few students are admitted as non-candidates for a degree or as special students for the purpose of taking a limited number of courses. In most cases, these are students making up deficiencies so they can enter a graduate program.

7.9 Policies for Validation of Transfer Credits

A credit adjuster in each teaching department is responsible for evaluating the courses taken elsewhere. A file of equivalent courses offered at other colleges, accumulated from previous evaluations, is maintained in the Office of Recruitment and Transfer Admissions. This enables the Transfer Admissions Counselor to furnish a tentative adjustment of credit at the time of admission. If any questions arise during the review of a student's transcript about the suitability of a course, he/she is referred to the proper credit adjuster after arrival on the campus. In general, the Transfer Admissions Counselor adjusts the credit for the common 55 hours of core courses and the related technical subjects while the programs adjust the credit for program subjects. A student may appeal a tentative adjustment. No credit is allowed for grades below C. Every effort is made to place the entering student in the proper courses in line with his/her abilities and previous preparation. Adjustment of credit may be revised if it develops that the student is unable to continue successfully because of inadequate preparation.

7.10 Assuring That Each Graduating Student Meets the Program Requirements

Throughout a student's career we hold advising sessions to help students select courses that will fulfill the degree requirements. Early in each student's last term, the program advisor conducts a senior audit with the student. During the audit the student's transcript is compared with the program requirements to assure that the degree requirements will be met at the end of the term. Because of changing degree requirements and course offerings, and because students transfer into the program with courses having different credit hours, some degree of flexibility is necessary. However the student must meet the total MSE course hours, total science/technical hours and total program hours must be met. Furthermore the student must have completed courses in

essential elements of the program (thermodynamics, transport, EMO, mechanical behavior, design, laboratory techniques, etc.)

If the current elections will fulfill the requirements a signed letter to that effect is sent to the Engineering College office that monitors the degrees. If the current elections do not fulfill the requirements a course of action is planned. This may involve the student registering for an additional course if it is not too late. Otherwise graduation must be postponed until a later date.

8. MECHANICAL ENGINEERING AND APPLIED MECHANICS

8.1 Program Educational Objectives

8.1.1 Educational Objectives

The Faculty has agreed that the mission of the Department is to prepare its graduates for diverse careers in both mechanical engineering and non-mechanical engineering fields. To do so, the faculty agree that the goal is to graduate students with a superb knowledge of mechanical engineering and outstanding problem solving skills that allow them to continue their education throughout their careers and to become leaders in their fields. The mission and the goal lead to three educational objectives:

1. To provide the necessary foundation for entry level engineering positions or further engineering degrees by a rigorous instruction in the engineering sciences and extensive laboratory and design experience.
2. To provide an integrated introduction to team work, communications, ethics, and environmental awareness needed to prepare the graduates for successful engineering careers and leadership positions.
3. To offer students the opportunity to deepen their technical understanding in a particular subject by a program of related technical electives or to obtain a broader education in engineering by a flexible choice of technical and free electives.

The Educational Objectives of the Mechanical Engineering Program are consistent with the mission of the University of Michigan and the College of Engineering. They are, in particular, closely aligned with the Curriculum 2000 educational objective, although the Mechanical Engineering Faculty has chosen to state them in a slightly different way.

8.1.2 Constituencies

The members of the faculty believe that they are, first and foremost, responsible to the students graduating from the program and that the success of the graduates is the success of the program. However, in order to produce successful graduates, the Department must be sensitive to the needs of industry and other potential employers. Therefore, the department seeks to stay in contact with its alumni and with their employers. In addition to informal contacts with both former students and industrial and government employers, the department has an extensive publication program to keep the various constituents informed on what is happening.

The departmental newsletter, *Mechanica* is produced 3 times a year and distributed to students as they return in the fall, as they leave in December, and as they leave in April. It is also mailed to all alumni, donors, faculty, emeritus faculty, College of Engineering administration, UM administration, Regents, parents of undergraduates, and everyone who is featured/shown in the publication. Current graduate and undergraduate students pick up their own copies for several distribution points. Approximately 14,000 copies are distributed. *Mechanica* is also archived in the Bentley Historical Library.

The Annual Departmental Report is produced yearly and is distributed to all donors, individual faculty member's business contacts, faculty, emeritus faculty, College of Engineering administration, UM administration, Regents, and everyone who is featured/shown in the publication. Approximately 4500 are distributed. They are also archived in the Bentley Historical Library.

In addition to the publication process, which seeks to inform the constituency about the department and which encourages free form input and feedback, the Department seeks more formal input by surveys of its students and alumni. The Department conducted surveys in 1992 and 1993 of both its seniors and alumni. The results of the 1992 surveys were collected in a report distributed to the faculty and other interested parties. The surveys were instrumental in the curriculum reforms that the Department has been engaged in for the last several years.

Due to lack of resources needed to process the results of these surveys and the essentially identical results of the 1992 and the 1993 surveys, they were not repeated in the following years. Similar one-time surveys were also conducted by other Departments in the Engineering College. As the College Curriculum 2000 reform were implemented, surveys were reinstated, but now under the administration of the Dean of Undergraduate Students. Three types of surveys have been conducted:

- *Senior Survey.
- *Alumni Survey.
- *Employ Survey

Other formal input also comes from External Advisory Board and the ME Student Leader Board.

The MEAM External Advisory Board (EAB) was established in the Spring of 1994. The first Board consisted of the Chair, and 5 other members, 2 of which were UM MEAM alumni, and all were from high positions in industry (2 VPs, 2 co. owners). The Board has grown over the years and changed from all of the first members. The current board consists of the Chair and 11 members, 9 of which are alumni, 9 also happen to be from high positions in industry (4 presidents of companies, 1 VP, 4 CEO's) and we've added 2 very distinguished professors to the group. All of the Boards to date have been white males, even though great effort has been made to locate suitable female and minority members. The Board meets twice a year, in the Spring and Fall, and acts as an advisory board to the MEAM Chair. Membership is by recommendation and is voluntary. Terms are for 3 years, and can be renewed. There is a charter. Input from the board consists both of informal comments from the various members, as well as written minutes of their meetings.

The Mechanical Engineering Student Leader Board (MESLB) was established in Fall of 1995 and consists of presidents and/or representatives of the various student societies active within the Department. The mission of the Board is to enhance the overall educational experience of MEAM students by improving communication and fostering a

greater sense of community and cooperation among various student groups. It also acts in an advisory capacity to the MEAM Chair. The MESLB meets once a month, and keeps minutes of its meetings.

8.1.3 Assessment of Program Objectives

The administrative structure of the Department is shown in Figure 8.1. The Department Chair (Ulsoy) works with the Associate Chair (Pierre) and the Program Advisors for both the Undergraduate Program (Thouless until 5/30/99; then Perkins) and the Graduate Program (Ceccio). The associate chair and the program advisors are appointed by the chair. This structure has been in place only for about one year. For several years, the department had several associate chairs, each assuming a distinct responsibility. Advising the Chair is an Advisory Committee, which meet every month, and the Student Leader Board (MESLB). The Advisory Committee consists of six tenured faculty members, elected by the faculty, each serving a three year term. Two new members are elected each year. The Chair, the associate chair, the program advisor, the administrative manager, and a representative from the MESLB form a planning committee where day to day operations of the Department and the allocation of the annual budget are discussed. Both program advisors are advised by standing program committees, whose members are appointed by the chair at the recommendation of the program advisors. Additional standing committees include: Honors and Awards Committee, Safety Committee, and a History Committee. Other committees, such as faculty search committees are appointed as needed.

The undergraduate program advisor and the undergraduate program committee have chief responsibility for the undergraduate program. The undergraduate program advisor chairs the undergraduate program committee and supervises the advising of undergraduate students in the Academic Service Office. The program advisor, in consultation with the program committee, deals with all non-standard advising issues, disciplinary cases, and petitions. The committee meets several times during each term, as needed. Traditionally, the role of the program committee has been limited to day-to-day issues. The recent curriculum changes have been carried out by the program advisor and the associate chair for planning, with input from *ad-hoc* review committees. However, as the new curriculum is nearly fully implemented, the responsibility of reviewing the program will now belong to the committee and the program advisor. The implementation of proposed changes, will still reside with the associate chair.

The program objectives were established by the Undergraduate Program Committee and voted on by the Mechanical Engineering faculty. A mission statement was originally voted on in a faculty meeting on 9/22/97, providing a general summary of the intention of the Department. After the College ABET Coordinating committee came up with a more specific format, the Departmental program committee proposed a draft of a new statement at a faculty meeting on 3/16/98. This draft included most of the original mission statement combined with the ABET educational outcomes. A draft of both the original mission statement as well as the modified one were given to the external advisory board members and their input incorporated into the final version. The faculty

voted to adapt this statement on a faculty meeting on 9/28/98. The statement had been sent to the ME student leader board for comments, but their input was not received until the day of the faculty meeting. The program committee subsequently discussed the input from the MESLB and incorporated some of the suggestions. The faculty approved the modified version at a faculty meeting on 10/19/98.

The review process is shown schematically in Figure 8.2. The review of program objectives is closely linked to the review of program outcomes.

8.1.4 Curriculum and Program Objectives

The Mechanical Engineering Curriculum meets the Program Objectives in the following way:

Objective 1 is met by several courses in mathematics, chemistry, and physics; a strong core in engineering sciences, laboratory experience in both physics and chemistry as well as two laboratory courses in mechanical engineering. The design experience is developed in three courses, the last of which is a senior design course.

Objective 2 is met by several components of Engineering 100, three Manufacturing/Design courses (ME 250, ME 350, and ME 450), and two laboratory courses (ME 395 and ME 495). All of these classes include open ended design projects that are solved in teams that must communicate the result of their work to the instructor and other “customers.” Aspects of ethics and environmental awareness are also addressed in these classes, as well as the various engineering science courses. The students generally take one Design/manufacturing or laboratory class per term. The concentration of many of these threads (teamwork, communication, ethics, environmental awareness, and design experience) into these classes was done to prevent undue demands on the student’s time. The students generally find it hard to organize group meetings and to plan group work. Limiting team projects, in particular, to one class per term should help the students manage their time.

Objective 3 is met by 12 credits of technical electives that allow the students to select three to four classes (3 or 4 credits each) from a large number of classes offered by the Mechanical Engineering Program, as well as a selected number of classes from other engineering departments. The student also offers 12 unrestricted electives and the students can satisfy the Social Science/Humanities requirement by selecting from a large number of classes as well.

In general, objective 1 and 3 are met solidly by the current program. Some aspects of objective 2 (such as teamwork) have been met by changes recently introduced into the program, but other aspects (such as environmental awareness) are currently being improved on.

8.2 Program Outcomes and Assessment

8.2.1 Educational Outcomes

Based on the Program Educational Objectives, the Faculty has developed the following Program Outcomes.

1. An ability to apply knowledge of mathematics, science, and engineering to mechanical engineering problems [ABET: 3a, Program].
2. An ability to design and conduct experiments, as well as to analyze and interpret data [ABET: 3b].
3. An ability to design thermal and mechanical systems, components, or processes to meet desired needs [ABET: 3c, Program].
4. An ability to function on multi-disciplinary teams [ABET: 3d].
5. An ability to identify, formulate, and solve engineering problems [ABET: 3e].
6. An understanding of professional and ethical responsibility [ABET:3f].
7. An ability to communicate effectively orally and in writing [ABET: 3g].
8. The broad education necessary to understand the impact of engineering solutions in a global and societal context [ABET: 3h].
9. A recognition of the need for, and an ability to engage in life-long learning [ABET: 3I].
10. A knowledge of contemporary issues [ABET: 3j].
11. An ability to use the techniques, skills, and modern engineering and computing tools necessary for engineering practice [ABET: 3k, Program].
12. A familiarity with chemistry, calculus-based physics, and advanced mathematics [Program].
13. Familiarity with statistics and linear algebra [Program].

The outcomes were determined to meet ABET requirement and the outcome required by the College. The relation between the required ABET outcome and the departmental ones are indicated in square bracket. In some cases, the ABET outcomes have been modified to include the outcomes required by ABET for Mechanical Engineering Programs.

These outcome also ensure the achievement of the Program Objectives. The Table below shows how the Program Outcomes support the Program Objectives.

	I	II	III
1	XX		
2	XX		
3	XX		X
4		XX	
5	XX		X
6		XX	
7		XX	
8		X	X
9	X	X	XX
10	X	X	X
11	XX		X
12	XX		X
13	XX		X

A strong relation is shown by X, and XX shows a very strong relation.

8.2.2 Curriculum and Program Outcomes

The primary way that Program Outcomes are satisfied is by the individual courses that students are required to take. The course outcome are related to the course objectives and the course objectives to the Program Outcomes. A significant focus on a give program outcome is marked by XX and a minor focus is marked by X. The course objectives and outcomes were developed by the faculty responsible for the course. The relation of the course objectives to the program outcomes were also developed by the responsible faculty.

8.2.3 Assessment of Program Outcomes

The Department of Mechanical Engineering has been using feedback from its constituency to assess the quality of the program and to help improve it for several years. To meet the new ABET requirement, this process has, however, been improved and formalized during the last year. The current assessment process is shown in Figure 8.2. The process has been divided into two loops, the inner loop (gray square) addresses the individual courses and the outer one addresses the program objectives and outcomes. The Undergraduate Program Committee conducts the review in both cases. For individual courses the committee examines samples of course content, course evaluations, and input from faculty teaching the course. The committee also seeks input from the student leader board and the course leader. The committee can make minor changes to the course objectives and outcomes in collaboration with the course leader and faculty teaching the course, but major changes must go through the complete process for modifications of the curriculum. This includes discussion in the departmental advisory committee, approval by the ME faculty, recommendation by the College Curriculum Committee and finally an approval by the College faculty. The outer loop addresses the program. The input used for this part consists of senior, alumni, and employer surveys plus input from the student leader board and the National Advisory Board. At this level, all changes are major changes and must be discussed in the departmental advisory committee, approved by the ME faculty, recommended by the College Curriculum Committee and finally approved by the College faculty. All data collected for both the course and the program assessment is archived by the Academic Service Office.

In the past, both assessment and implementation of program changes rested with the Undergraduate Program Advisor and the Associate Chair for Planning. Now, however, the Department Undergraduate Curriculum committee and the Undergraduate Program Advisor have been assigned a central role in the assessment. The committee reviews all available material and reports to the Department Chair, the Associate Chair, and the Department Advisory Committee. The Associate Chair, who is in charge of teaching assignments, has primary responsibility for implementing program changes. This includes working with faculty interested and willing to lead changes, finding support for summer months to work on course development and extra teaching assistant help, and providing relieve from teaching to give faculty more time to work on a specific course. In the past, the Associate Chair has done this very successfully and there are good reasons to

believe that this approach will continue to be the most effective way to improve individual courses.

As the formal process evolves, the material that the Undergraduate Program Committee uses to assess the program objectives and the program outcomes is likely to evolve as well. The Committee has gone through the evaluation once, in May 1999, producing a memorandum to the Chair suggesting what program improvements are necessary. The material considered by the Committee was:

Senior surveys. Those were conducted in the Senior Design Class, ME 450, during the fall 98 term and winter 99 term. The Engineering College processed the surveys and the provided the results to the Department in tabular form.

Alumni survey. Those were conducted in the fall of 98, requesting inputs from students graduating in 1996, 1993, and 1988. The Engineering College processed the surveys and the provided the results to the Department in tabular form.

Student course evaluation forms. During the early fall of 98, the student course evaluation forms (which have been in place for at least two decades) were modified to address the specific outcomes of each class. The evaluation forms were processed by the University Office for Evaluation and Examination. The forms are returned to the instructors, but a summary form is provided to the Department.

In the future, the undergraduate program committee will also examine the following material:

Employee survey. A pilot study has been conducted by the College, but the data had not been processed when the Committee met.

Course grades. The grade that a student receives for each course is the primary measure of whether he or she has achieved the course outcome. The Undergraduate Program Committee examined the grade distribution in the department last year and found it to be very consistent between courses and sections of courses. This does, however, not address how well the grade reflects what the student learned. The committee will examine the material that has been gathered for the ABET visit this fall and plans to conduct checks on individual classes in the future. The student evaluations forms for individual classes have been changed this year to address the individual course outcomes. This will also help the committee assess whether there is a reason to conduct a more in-depth examination for individual courses.

Thread grades from Design/Manufacturing and Laboratory classes. The integration of a number of “threads” into several course calls for a separate assessment of the threads.

These threads are: Teamwork, communications, ethics, environmental awareness. The integration of the threads is still ongoing (except teamwork) and a complete assessment strategy has not been established. A part of the strategy will be a separate thread grade that will be given in each course that contains the thread. The thread grade will be a part of the course grade, but will be recorded separately.

Since much of the material used in the formal evaluation by the Undergraduate Program Committee was not available until after the term was over, it was not possible to seek input from the ME Student Leader Board. In the beginning of the fall 99 term, the material examined by the Program Committee, along with the memorandum to the Chair will be given to the board and their input sought. An abbreviated version will also be given to the External Advisory Board before their fall meeting and to the ME faculty. Input from the Boards and the Faculty will be addressed by the Program Committee during the fall.

8.2.4 Examples of Actions Taken in Response to Input from Constituents

While the new process has only been in place for a short time and it is not yet possible to completely assess its success at present, the Department has considerable experience using input from its constituents to initiate curriculum reform and changes. Here we give a few more specific examples.

Teamwork

In the 1992/93 surveys, working in teams was identified as a very important skill for a professional engineer and one where the Department did not offer much preparation. This was consistent with more informal input from the External Advisory Board as well as studies conducted by others. While some action had already been taken to introduce teamwork in both the design courses and laboratories, the strengthening of teamwork became a major focus of the reformulation of the ME curriculum. Three courses in manufacturing and design (ME 250, ME 350, and ME 450) all have a major team project and the laboratory classes (ME 395 and ME 495) have several smaller team project.

The surveys conducted this year indicate that the teamwork component has been implemented very successfully. The following table shows the result of the 1998 alumni survey. While it is possible that part of the change is due to a change in perspective as the graduates gain more experience, the increase has coincides with major effort to increase teamwork training.

Year graduate d	Excellent 5	Good 4	Some 3	Slight 2	None 1	Weighte d average
1988	11.3%	30.2%	26.4%	24.7%	7.5%	3.13
1993	21.3%	35.5%	30.3%	13.2%	0.0%	3.65
1996	41.8%	38.0%	17.7%	1.3%	1.3%	4.18

The alumni graduating 1996 also list teamwork as one of the strengths of the Program. In the senior survey, the students rate the preparation given in teamwork comparable to the engineering science. If there still is a problem, it is perhaps the opinion of some of the seniors who feel that there is too much emphasis placed on teamwork. This is likely to be, in part, due to not enough emphasis placed on telling the students why teamwork is important. The result of the alumni survey will be used to motivate students in several classes in the fall of 1999.

Communications

The surveys in 1992/93 also identified technical communication as a skill that is extremely important for the practicing engineer, but not well addressed by the curriculum. The following table shows the result of the 1998 alumni survey.

Year graduate d	Excellent 5	Good 4	Some 3	Slight 2	None 1	Weighted average
1988	3.8%	22.6%	47.2%	20.8%	5.7%	2.98
1993	13.2%	32.9%	38.2%	14.5%	1.3%	3.42
1996	10.3%	41.0%	33.3%	14.1%	1.3%	3.49

While the result indicate that some improvement took place between 1988 and 1993, little changed during the next three years. This is not unexpected since the implementation of a major communication component into the manufacturing/design courses and the laboratory courses has been taking place during the last year. The integration in the laboratory courses has run into a few logistics problems and ME 395, for example, was rated poorly by the students in the fall 1998 term. The MESLB also provided input for the class, reinforcing that several problems had to be addressed. Considerable changes were made in how the technical communication component was organized in the winter 1999 term and the student evaluations suggest that the changes have helped. The table below shows the student response to a few questions from the student evaluation form:

Questions	Fall 98	Winter 99
Overall, this is an excellent course	2.80	3.65
Overall, this is an excellent instructor	3.75	3.81
Improvement in writing	2.68	3.66
Improvement in communication of technical info	3.64	3.93

Two instructors teach the class and the average ratings is reported in the table. Although the instructors are different, all four are excellent teachers and their evaluation is comparable between terms.

Academic Advising

Around 1995 the Student Leader Board (MESLB) raised strong concerns that

students were unable to obtain easy access to an advisor with questions regarding their degree progress. Several attempts have been made to address this concern. Those include assigning students to each faculty member in the department (about 20 per faculty), with the expectation that they would be available to students 2-4 hours per week; training volunteer peer advisors from the Honors Society; and appointing a group of six faculty advisors to share the advising. None of these modes of advising proved successful.

In Fall 1997 a Peer Advisor position was created in the Academic Service Office and staffed by a Graduate Student Instructor. The GSI earned the BSE(ME) from this department and therefore knew many of the academic requirements, rules, and regulations first hand. The Peer Advisor has now been in place for four terms and informal feedback from the students suggest that format is working well. Students now have the opportunity to have walk-in questions answered immediately. In addition, Web Pages have been developed which provide a details of the degree requirements, with links to discussions of college and departmental rules, as well as providing answers to common questions from students. Furthermore, the entire student body is on an email group which is maintained by the Student Advisor. Information pertaining to deadlines, scholarships & awards, and many curriculum issues are addressed and our students kept well informed. However, the senior survey (Fall 1998 and Winter 1999) show that academic advising still remains a concern. The students taking this survey did, for the most part not benefit from the Peer Advisor. They also went through the curriculum at a time when considerable changes were taking place, thus putting more strain on both the students and advising. The survey next year should give a better indication of how well the new system is working.

8.2.5 Material Available for Visit

Material from courses taught in Fall 1998 and Winter 1999. The material consists of samples of student work from 2-5 students in each course and the text book or course pack used.

- Course evaluations from students.

- MESLB note book. Includes mission and minutes of meetings

- Minutes of Faculty meetings and Advisory committee meetings

- Minutes of the External Advisory Board Meetings

- Departmental Planning Document, Spring 1997. This document is currently being updated.

- Reports of an Internal Departmental Review Committees, 1998

- Report of an External Departmental Review Committees, 1998

- MECHANICA. The Departmental newsletter.

- Annual Department Reports

- A document describing procedures for various administrative tasks.

8.2.6 Transfer Students

The records of transfer students are reviewed by professional admissions officers under the College Director of Transfers and Admissions. If they have completed all the required pre-requisites and meet published GPA requirements (both overall and in

mathematics, science and engineering) their admission to the program is automatically approved. If the record is not satisfactory in some minor regard, it is forwarded by the College to the Director of Undergraduate Studies. A final decision is made by the Director of Undergraduate Studies, in consultation with members of the Undergraduate Program Committee.

8.2.7 Credit for Courses Taken Elsewhere

There are several mechanisms for validation of credit for courses taken elsewhere. Classes used to satisfy a pre-engineering requirement are evaluated by professional admissions officers under the College Director of Transfers and Admissions. A data-base is maintained by the college of equivalent classes. Information about lower division ME classes is forwarded to the Director of Undergraduate Studies who obtains an evaluation on equivalence (using information such as text-book and details of the lecture schedule). A data base is then maintained in the college for future use. Mechanical Engineering credit at the 300-level or higher can only be transferred on a case-by-case basis. Permission to transfer credit must be granted by the Director of Undergraduate Studies. Students need to provide details of the class they wish to take, their educational record at UM and elsewhere, and the reasons for requesting permission to take a class outside the department. The details of the class are evaluated by the appropriate faculty, and a final decision is made by the Director of Undergraduate Studies.