MANUFACTURING ENGINEERING TECHNOLOGY

BACHELOR OF SCIENCE PROGRAM

SELF STUDY FOR ACADEMIC PROGRAM REVIEW

Ferris State University
College of Technology
Big Rapids, Michigan 49307

September 15, 1998

SELF STUDY FOR ACADEMIC PROGRAM REVIEW

MANUFACTURING ENGINEERING TECHNOLOGY BACHELOR OF SCIENCE PROGRAM

College of Technology
Ferris State University
Big Rapids, Michigan 49307

September 15, 1998

Program Review Panel

Program Faculty

James A. Rumpf, Chair
Associate Professor of Manufacturing Engineering Technology
Gary L. Ovans
Associate Professor of Manufacturing Engineering Technology and Program Coordinator
David H. Anderson
Professor of Manufacturing Engineering Technology
Bruce M. Gregory
Associate Professor of Manufacturing Engineering Technology
Peter J. Smania
Professor of Manufacturing Engineering Technology
Billy R. Thomas
Associate Professor of Manufacturing Engineering Technology

Other Faculty

John C. Valas
Professor, Management

Industry Representative

Mark Herman
Manufacturing Engineer, Acutex Div., SPX Corporation

PREFACE

The Manufacturing Engineering Technology (MFGE) BS program was selected for academic program review in the 1998-1999 cycle. This report, prepared by the MFGE Program Review Panel (PRP) and submitted to the Academic Program Review Council (APRC), responds to the requirements and guidelines established for the academic program review process.

Organization of the report follows the Council guidelines. Section 1 presents an overview of the program, including mission, history, impact, expectations, and plans for improvement. Sections 2 through 9 cover results and analyses of data collection activities. Section 10 reviews enrollment trends, and Section 11 presents program productivity and cost information. Section 12 contains conclusions based on the data analysis, and Section 13 has recommendations addressing program strengths and weaknesses.

Members of the committee and their primary responsibilities:

Jim Rumpf (Chair)	Overview, Curriculum Evaluation, Enrollment Trends, Program Productivity, Conclusions, and Recommendations
Gary Ovans	Student Evaluations, Employer Survey, and Resource Location
Bruce Gregory	Facilities & Equipment
Dave Anderson	Faculty Perceptions
Pete Smania	Graduate Survey
Mark Herman	Industrial Advisory Board Perceptions
John Valas	Labor Market Analysis
Bill Thomas	

Messrs. Herman and Valas graciously agreed to assist the MFGE program in this effort as Industry Representative and Other Faculty, respectively. Their willingness to commit time and efforts beyond their own job's requirements is appreciated.

We also wish to express our appreciation and thanks to our students, alumni, and all other fellow faculty, staff, and industry representatives who contributed to this work. The MFGE PRP remains available to meet with the APRC to discuss this report.

TABLE OF CONTENTS

SECTION 1

OVERVIEW

A. GOALS AND OBJECTIVES OF THE MFGE PROGRAM

The mission of Ferris State University is to be a national leader in providing opportunities for innovative teaching and learning in career-oriented, technological, and professional education. This could very well be word-for-word the mission statement for the bachelor of science (BS) program in manufacturing engineering technology (MFGE) at Ferris started with in 1976, because that is what the MFGE program has been doing now for over 22 years.

The 1997-1999 FSU Catalog states that the program prepares individuals in the development, design, analysis, planning, supervision, and construction of methods and equipment for the production of industrial and consumer goods. Just saying so doesn't make it so, though; it is our responsibility in this report to show how this has been and will continue to be done.

B. HISTORY OF THE MFGE PROGRAM

The MFGE program has played and continues to play many roles for the Ferris State University community. It is a ***cornerstone*** of the College of Technology, as the original BS in engineering technology (introduced by J. Edward Nicks et al in 1976). It is the ***wellspring*** from which many of Ferris' most popular programs have flowed, with the Plastics Engineering Technology BS program (1982), Welding Engineering Technology BS program (1984), Product Design Engineering Technology BS program (1988), and the Quality Engineering Technology BS program (1997) all beginning as specialized areas of concentration under the MFGE umbrella. It has now even grandfathered a program (Rubber Engineering Technology, commencing in 1998). It is an ***originator*** in many ways; for instance, reaching out to the continuing education student market by being the first (1984) and still most popular Ferris program offered at night in Grand Rapids, garnering a state grant to provide a new metal stamping option via distance learning technology directly to industrial sites (the first in the College to do so on both counts), and offering the Quality Technology Certificate program both on- and off-campus simultaneously. It is a ***trendsetter***, having inspired copycat programs at nearby schools such as Grand Valley State University, Western Michigan University, and Central Michigan University, as well as feeder programs at numerous community colleges through the state. It is an ***innovator***, having been the first (and to date one of the few) College of Technology programs to have three of its courses designated as writing-intensive. It is an ***enabler***, consistently placing its graduates in the top five on the list of starting salaries by not only getting graduates good jobs, but getting them a choice of good jobs, with over 85% still in Michigan and contributing back to the state. It is the

taproot that steadies and nourishes numerous other programs within the department, college, and university by providing service courses on basic and advanced manufacturing topics. And, so far, all of this has been accomplished with a minimum of marginal investment in facilities, equipment, and personnel.

C. MFGE CURRICULUM

The MFGE program is a "+2" program, meaning that we do not start at the freshman level with students; those wishing to enter our program must already possess an associate degree (or equivalent) in a manufacturing related program. To this experience we add (depending upon specific courses taken) 41 credits of MFGE-major courses plus a 4-credit internship, 9 credits of related technical coursework, 8 credits in math and science, and 12 general education credits, some directed. A complete MFGE program checksheet and its associated general education worksheet are included in Appendix A. Between the clear entry and exit requirements on the back of the checksheet and the general education worksheet, we have found many students to almost be "self-advising".

A few of the unique aspects of the Ferris MFGE curriculum are:

- the concentration on production process planning rather than systems engineering common to other manufacturing programs. Where other schools teach their students to be able to make one of anything, we go beyond that, teaching our students to be able to make many of anything, and to do it the most economical way possible.
- the requirement that graduating seniors take the Society of Manufacturing Engineers' (SME) Certified Manufacturing Technologist exam to benchmark our seniors against practicing engineers in their field. By SME rules, students can not be required to pass, but we do pass approximately 50-60% on the first try every year, which is more than twice the pass rate at some competing schools.
- the number of group projects and technical presentations the students are responsible for in the space of only two years. The is at least one major term project and presentation due every semester, with several cross-course projects and one that combines the efforts of both juniors and seniors.

D. PERSPECTIVE

Continuous improvement is not just a course that happens to have an MFGE prefix. It is a quest more than a goal, and we try to apply it to self, program, and college. Some issues we are actively trying to improve (all references in this section can be found in Appendix B):

- <u>Quality of our program</u> - We continually benchmark ourselves against programs that have been identified as world-class, direct competition to us, or both, and make the necessary changes to try to stay ahead of the pack. Communications like the sample unsolicited testimonial and request for co-op information tell us that we are meeting or exceeding our customers' expectations in that regard.

- Communications skills of our graduates - In conjunction with Professor Tom Brownell, several years ago we started using some measurement tools to gage our students' writing ability when entering and when exiting our program. Writing skills do improve over the course of the two years in the MFGE program through our three writing-intensive courses (MFGE 324, MFGE 393, and MFGE 421), and they specifically improve in the are of technical communication.
- Equality of off-campus offerings - We determined that our off-campus students at the Applied Technology Center in Grand Rapids were not receiving equivalent service to on-campus students. We took our concerns to our immediate past interim dean, who crafted a letter outlining the inequities that existed.
- Wider range of offerings - MFGE faculty have been active for several years in proposing expansion of our program bidirectionally. Several proposals for both AAS and MS programs have been developed, but have stalled because of ongoing administrative changes within the College of Technology.
- Increasing amount of service - Besides the services listed on the accompanying sheet of MFGE faculty activities, several MFGE faculty also conduct seminars on a variety of manufacturing topics, both to individual companies and to general audiences through international organizations such as the Society of Automotive Engineers (SAE).

E. CHALLENGES

The main challenges to the MFGE program are as follows, and are discussed elsewhere in this report:

- *Faculty Recruiting & Development* - how to keep current in the dynamic field of manufacturing with limited access and resources for upgrading skills, and how to attract and keep qualified instructors.
- *Competition* - from outside, as other schools increase efforts in the manufacturing field, and from within, as we compete with other growing Ferris programs for a dwindling pool of candidates.
- *Facilities and equipment* - no labs to compare with other schools, and scant resources for equipment.

We look forward to meeting these challenges head on, and offer this report as the next step in this continuing effort.

SECTION 2

GRADUATE SURVEYS

A. INTRODUCTION

The purpose of this survey is to learn from the graduates their perceptions and experiences regarding employment based on program outcomes. The goal is to assess the effectiveness of the University and the program in terms of job placement and preparedness of the graduate for the marketplace.

Data from two separate surveys, the FSU 1996-97 Graduate Followup Study (tabulated by Career Services) and the FSU College of Technology Alumni Survey, were analyzed to assess the effectiveness of the MFGE program in particular and the university in general in terms of job placement and preparedness of the graduate for the marketplace. Results and analysis follow.

B. FSU 1996-97 GRADUATE FOLLOW-UP STUDY

Although this study represented the entire university, program specific data was found representing our Manufacturing Engineering technology students. Page 5 from this study represents the annual salaries for doctorate, master, and bachelor degree graduates. Please note that the average salary reported by our students was $45,500, which was the highest average salary of all 10 bachelor degrees in the College of Technology by a considerable amount. The average salary was only exceeded university-wide by the Masters Information Systems Management, Doctorate of Optometry, and Bachelors of Pharmacy degrees. However, our high range salary matched the highest of the entire University. The entire University tabulated results showing MFGE placement are included in Appendix C.

The following data was also found representing the student placement profile for 1996-97 in the College of Technology:

- our student response rate was 83% (20 out of 24 total)
- two of this group were doing additional undergraduate work and two were doing graduate work.
- 19 out of 20 were currently employed with 18 being employed in their field. However, no one was seeking employment.

C. FSU COLLEGE OF TECHNOLOGY ALUMNI SURVEY

The FSU College of Technology regularly surveys alumni on a number of different issues similar to the university follow-up study. On the Alumni Survey for Graduation Years 1991-1994-1997, a total of 48 MFGE alumni were mailed the questionnaire, with 19 MFGE alumni responding. The following points were determined:

- All responses were of a white race and of male gender.
- Age ranged from the twenties to the forties.
- Median grade point average is 3.000.
- The largest frequency for annual salary range was in the $30,000 bracket. The lowest reported annual salary was in the $18-20K bracket. However, 3 were in the $40-50K range, 4 were in the $50-60K range, 2 were in the $60-70K range, and 2 were over $70K.
- Seventeen are employed in a field related to the program taken at Ferris. One graduate left the Manufacturing Engineering field for higher pay.
- Three are continuing their education with one being in the Armed Forces.
- Ten of them entered the Manufacturing Engineering Technology program from a 2-year college program and only one each from a 4-year college or the military.
- Major sources of college funding were college employment and summer employment.
- Minor sources of college funding were parents, college and summer employment, personal savings, educational grants and scholarships, and loans.
- The primary reasons for attending Ferris were the coursework desired, reputation, social atmosphere, financial aid, and convenient location.
- 11 of the 19 responses had a job prior to graduation with 2 being in the 4 to 6 month category looking for their first full-time job.
- Ten of the 19 had a beginning annual salary in the $30,000 range which was the highest choice given on the questionnaire.
- Nineteen reported that they learned of their first job from their faculty advisor along with some duplication from several other area's such as the placement office.
- The highest frequency of 9 was given for enough pay being a problem in finding their first job, but 9 also said that money was no problem.
- The kind of job and location of the job was a minor consideration in obtaining their first job.
- The 19 responses regarding how well did Ferris prepare you for your present occupation were:

    1 for exceptionally well
    6 for more than adequate
    11 for adequate
    1 for less than adequate
- Seventeen of 19 responses are working in the field of manufacturing.
- 84 to 89% of them indicated satisfaction with job challenge, location, working conditions, career potential, salary, benefits, and advancement potential.
- Fourteen of 19 responses have had only one employer since graduation.

- Eleven of 19 responses felt that the program faculty were genuinely interested in the welfare and professional development of students. The other eight responses felt the same with some reservations.
- Fifteen of 19 responses would advise a friend to enroll in Manufacturing Engineering Technology. The other 4 responses felt the same with some reservation.
- Only one felt that program courses were not offered at a convenient time.
- Sixteen of them felt that the MFGE courses covered new material and important material without being redundant. Nine of this group had some reservations, while 3 other responses did not feel the coursework covered enough new and important material.
- Only 2 felt that department members were not actively helping graduates of the program to find appropriate employment.
- Only 1 felt that they would not start over in the major program again.
- Only 1 felt that there was not good communication between faculty and students regarding student needs and concerns.
- Thirteen felt that many opportunities existed outside the classroom for interactions between students and department faculty. Seven of this group had some reservations, while 6 other responses felt that there was not opportunity.
- Two felt that the interactions and discussions with peers in the department were not a major source of motivation and support.
- Four felt that department members did not help students to explore ways of continuing their education after graduation from FSU.
- Six of them have continued their education and all as part-time students. One of these was on a main campus with 4 using distance learning. All 6 stated they had tuition assistance from their employer.
- Six of them stated that they had a professional license or certification.
- Two of them stated that they have a Masters Degree with 8 others planning to get one.
- One was planning to obtain a Doctorate degree.
- Eighteen stated that they would recommend FSU to a friend, relative or co-worker. One stated no to this question.
- Eleven of them stated a need for continuing education such as seminars and workshops in their area of study.

D. QUESTIONNAIRE SUPPLEMENT

The purpose of this supplement (see Appendix C) is to:

- Obtain graduate input to how relevant specific course content is to their occupation. The not relevant and/or decrease responses are very low in every category, suggesting that the current curriculum is acceptable as a whole to this group surveyed. Obviously the curriculum must improve and change with current and emerging technologies.

- Provide a current work experience listing. The list of job function responses related to the surveyed graduates' current positions is typical of a Manufacturing or Tool Engineer, further supporting the current curriculum.

- Provide the graduates with an opportunity to offer suggestions and/or comments about the aspects of the curriculum that were not a part of the questionnaire. All of the 5 comments have been discussed by the program faculty, and since our curriculum is continually being evaluated, appropriate changes will be made as required.

SECTION 3

EMPLOYER SURVEY

A. INTRODUCTION

This activity is intended to aid in assessing the employers' experiences with graduates and their perceptions of the program itself. A mailed instrument should be used to conduct the survey: however, if justified, telephone or personal interviews may suffice.

The employer survey was conducted by mail. A short to-the point survey instrument was used (see Appendix D). Our network of alumni was used to identify survey sites. A cover letter requested that the individuals best qualified to respond to the survey questions be provided the opportunity to do so. A sample size of 50 randomly selected sites was used.

B. SURVEY RESULTS

The response to the mailed survey was abysmal. As of September 1, 1998, only eight surveys had been returned. A follow-up telephone survey was conducted and the effort netted a few more responses. Responding companies included:

- Howmet - Turbine Components - Whitehall, MI
- Michigan Automotive Compressor - Jackson, MI
- Delphi - Coopersville, MI
- Modine Manufacturing Racine, WI
- Delphi, Saginaw, GMC, Saginaw, MI
- Miller Bros. Manufacturing - Homer, WI
- Whirlpool Corp. - Marion, OH
- Proos Manufacturing - Grand Rapids, MI
- Briggs & Stratton - Ravenna, MI
- UNC-Johnson Technology, Muskegon, MI
- Prince Corp. - Holland, MI

The complete list of employers of our 449 graduates would read like a "Who's Who" of the manufacturing world, from international corporations like General Motors, Ford, and Steelcase, down through medium- and small companies all the way to several alums who have started their own companies. Several are also employed by academia, including Bruce Gregory, associate professor in the MFGE program, and Jack Gregory, associate professor in Ferris' Manufacturing Tooling Technology AAS program.

The questions we asked were short and to the point, and the answers received were just as direct:

1. How many Ferris graduates do you employ?

Table 3-1 contains the results for Question 1, covering 25 graduates in total.

Table 3-1
# of Ferris MFGE Graduates at Surveyed Companies

# of Ferris MFGE graduates	1	2	3	4	5	6	7
# of companies with the above	6	2	1		1		1

2. What percentage have the skills you require?

Table 3-2 contains the responses to Question 2. Two of the eleven companies responding did not answer this question.

Table 3-2
Percentage of graduates that have necessary skills

% of graduates w/ skills	100%	90-99%	80-89%	70-79%	60-69%	50-59%	40-49%	30-39%	20-29%	10-19%	0-10%
# of companies responses	7	1								1	

A followup phone call to the company that rated a graduate as having only 10-15% of the necessary skills revealed that the person answering the survey misunderstood the question and meant to answer in the 90-99% range.

3. What improvements are needed in the preparation (undergraduate education) of that group?

The following comments were received:

- None noted
- Improved computer/analytic skills
- Couldn't comment
- Drafting, controls, system design (equipment/people)
- Practical applications, speeds & feeds & time management are always important
- More application of statistics (control charting), capability analysis (MSE) to real world situations. Increased knowledge of resistance weld process, electrical, hydraulics, etc.
- Production planning, more welding overview, internships (school 1 semester / work 1 semester)

4. Would you consider hiring a Ferris graduate again in the future?

No table is required to show that 100% of respondents answered Yes.

C. COMMENTARY

The primary concern of this survey was to evaluate the preparation of Manufacturing Engineering Technology graduates with respect to the needs of the marketplace. Since a number of the responses are from employers who may have experience with graduates who have graduated before the most recent curricular changes, their responses may not be a good indicator as to program currency. In retrospect, the survey should have been designed to recognize the differences imposed by graduation date. Almost all of the changes suggested by survey respondents (with the exception of the "co-op" program mentioned in the last comment) have already been incorporated into the MFGE program.

There can hardly be a better endorsement for the MFGE program than the 100% affirmative answer to question 4. The response to "Would you consider hiring a Ferris graduate again in the future?" was predictable. Graduates of the MFGE program enjoy a 100% placement rate. Calls for graduates as well as for interns and part-time help come in throughout the year. Employers are experiencing a shortage of qualified technical personnel to the extent that they are also regularly requesting resumes from faculty members.

SECTION 4

STUDENT EVALUATIONS

A. INTRODUCTION

<u>Student Evaluation of Instruction</u>: *Students are surveyed to obtain information regarding quality of instruction, relevance of courses, satisfaction with program outcomes based on their own expectations. The survey must seek student suggestions on ways to improve the effectiveness of the program and to enhance the fulfillment of their expectations.*

Input was solicited from:

- MFGE students (on campus) at the completion of their junior year, May 1998.
- MFGE students (on campus) at the completion of their senior year, May 1998.
- MFGE students enrolled in the evening program at the Applied Technology Center in Grand Rapids.

NOTE: Students enrolled in the MFGE Metal Stamping track were not surveyed. This offering utilizing a tape-delay format is planned to be discontinued Winter Semester, 2000.

The survey instruments appear in Appendix E.

For reporting purposes, and because we only received one response from that group, input from MFGE students enrolled in the evening program at the Applied Technology Center in Grand Rapids has been folded in with the input from the on-campus MFGE seniors.

B. SURVEY RESULTS FOR MANUFACTURING ENGINEERING TECHNOLOGY JUNIORS

The quantitative results for the survey of the juniors are shown below, followed by summary comments.

Program Enrolled	Manufacturing Engineering Technology			
Age	20, 21 (5) , 22(3), 23(2), 24(4), 27, 28, 34			
Sex	Male	18	Female	0

Big Rapids Campus	18
Grand Rapids ATC	0
Metal Stamping	0

Survey results for MFGE Juniors (cont'd)

High School	**Location**
A.D. Johnson High School	Bessemer, MI
Alpena High (2)	Alpena, MI
Cheboygan High	Cheboygan, MI
CMR	Great Falls, MT
Forest Hills Northern (2)	Grand Rapids, MI
Hart High School	Hart, MI
Marion High	Marion, MI
Newaygo High School (2)	Newaygo, MI
Ontonagon Area H.S. (2)	Ontonagon, MI
Ottawa Hills (2)	Grand Rapids, MI
Rogers City High School	Rogers City, MI
St Clair High School	St Clair, MI
White Cloud High	White Cloud, MI

Year Graduated 1983, 1988 (2), 1992 (2), 1993 (2), 1994 (5), 1995 (6)

Transfer Student

Yes 9
No 9
If yes, where from? Alpena Community College (4)
Gogebic Community
Grand Rapids Community College (2)
NCMC
St. Clair County Community College

1. **Who/what helped you decide to come to Ferris State University?**

Counselor	4
Parents	8
Other Relatives	4
Teacher	10
Friends	5
Co-Workers on job	2
Advertisements	0
Other	3
Comments	Financial Aid Closer to Home

Survey results for MFGE Juniors (cont'd)

2. **Who/what helped you decide to enroll in the MFGE program?**

Counselor	2
Parents	4
Other Relatives	2
Teacher	13
Friends	3
Co-Workers on job	1
Advertisements	0
Other	2
Comments	Was what I was looking for. Myself

3. **Your impression of the Application/Admissions/Financial Aid/Registration:**

Very Favorable	0
Favorable	10
Neutral	7
Unfavorable	1
Very Unfavorable	0
Comments	Unfriendly people. Can be confusing, information difficult to get at times. Need to organize and locate centrally. Not very helpful at getting new students Financial Aide info and notices of payments due - thus dropped schedules.

4. **Your impression of the Manufacturing Engineering Technology program faculty:**

Very Favorable	3
Favorable	13
Neutral	1
Unfavorable	0
Very Unfavorable	0
Comments	Courses and teachers very good. Hope to see how skills apply during Internship. Really care about the students. Need to get rid of some instructors and get some instructors that can present information, in many ways to the students.

Survey results for MFGE Juniors (cont'd)

5. What is your impression of the laboratory facilities and equipment for your courses:

Very Favorable	1
Favorable	12
Neutral	5
Unfavorable	0
Very Unfavorable	0
Comments	Adequate, but could be updated in some areas. Could use more computer labs for open use not just for classes. Could use some new equipment. Most is up to date and practical.

6. What is your impression of the Manufacturing Engineering Technology program course of study?

Very Favorable	5
Favorable	12
Neutral	1
Unfavorable	0
Very Unfavorable	0
Comments	Very Challenging All course subject material seems applicable. The course of study should be taught from the perspective that students in this B.S. program come from very different areas of study and should be taught that way. Not just from one perspective.

7. What are your plans after completing your B.S. Manufacturing Engineering Technology degree?

Go to work	6
Go to work and attend school part-time	10
Stay in school and enter a M.S. degree program	0
Enroll in another B.S. program at Ferris State University	2
Transfer to another university	1
If so, where: Michigan Tech.	
Undecided	0

Evaluation/summary of juniors' comments:

- The survey results indicate that, for this group of students, an equal number are internal and external transfers into the program.
- The student ages indicate that there are some who are returning to earn their BS degree after a period of time in the workforce.
- Teachers and parents were the greatest influences in determining their school of choice.
- Teachers had the greatest impact in terms of steering students to the Manufacturing Engineering Technology program.
- Ferris' financial aide process appears to stand some improvement. Note: In retrospect this question should have been stratified, with input requested separately for Applications, Admissions, Financial Aid, and Registration.
- The program faculty and the program itself seem to be favorably viewed.
- The response to laboratory facilities and equipment was more favorable than expected. They, possibly, do not realize that the equipment they used was, by and large, borrowed from other programs. Possibly the faculty were making very good use of what limited resources they had available.
- More than half of the students have intentions of continuing their education. At least on a part-time basis.

C. SURVEY RESULTS FOR MANUFACTURING ENGINEERING TECHNOLOGY SENIORS

The quantitative results for the survey of the seniors are shown below, followed by summary comments.

Program Enrolled Manufacturing Engineering Technology

Age 20, 21 (5) , 22(3), 23(2), 24(4), 27, 28, 34

Sex Male 20 Female 0

Big Rapids Campus	19
Grand Rapids ATC	1
Metal Stamping	0

Survey results for MFGE seniors (cont'd)

High School	**Location**
Coleman	Coleman, MI
Harrison	Harrison, MI
Northview (2)	Grand Rapids, MI
Traverse City (2)	Traverse City MI
Kingsley	Kingsley MI
Manchester	Manchester, MI
Ludington	Ludington, MI
Byron Center	Byron Center, MI
Middleville	Middleville, MI
Petoskey	Petoskey, MI
Coopersville Public	Coopersville, MI
Ionia	Ionia, MI
Big Rapids	Big Rapids, MI
Bay City Western	Bay City, MI
Holland	Holland, MI
St. Patrick's	Portland, MI
Romeo	Romeo, MI

Year Graduated 1986, 1990, 1991 (3), 1993 (9), 1994 (5)

Transfer Student

Yes 11
No 8

If yes, where from?
Mid Michigan CC
GRCC (4)
Northwestern Mich. College (3)
Westshore CC
Lansing CC
Baker College of Muskegon

1. Who/what helped you decide to come to Ferris State University?

Counselor	9
Parents	6
Other Relatives	1
Teacher	4
Friends	2
Co-Workers on job	1
Advertisements	0
Other	5
Comments	I got talked into it; Campus Visit; Hands on Education; Local

Close Proximity to parents and job

Survey results for MFGE seniors (cont'd)

2. Who/what helped you decide to enroll in the MFGE program?

Counselor	6
Parents	5
Other Relatives	2
Teacher	5
Friends	4
Co-Workers on job	1
Advertisements	0
Other	7

Comments

Personal Interest Myself

Hand on Past Work Experience

Job Related

I got talked into it

Always liked Area

3. Your impression of the Application/Admissions/Financial Aid/Registration:

Very Favorable	1
Favorable	10
Neutral	6
Unfavorable	2
Very Unfavorable	0

Comments

Too slow, not reliable

I can't understand why we need to see an advisor everytime we have to register

Not enough info about scholarships

Financial Aid was easier after the Federal loan program started in 1996

4. Your impression of the Manufacturing Engineering Technology program faculty:

Very Favorable	3
Favorable	14
Neutral	2
Unfavorable	0
Very Unfavorable	0

Comments

Some of the instructors are very poor.

They are very knowledgeable of the material that is covered in class

Survey results for MFGE seniors (cont'd)

As with any environment personality conflicts will happen. There are those faculty that are great while others are not so great.
Could concentrate on more tech, less statistic, metrology is useless.
Instructors knew information (industry related) specific to the course

5. What is your impression of the laboratory facilities and equipment for your courses:

Very Favorable	0
Favorable	9
Neutral	7
Unfavorable	3
Very Unfavorable	0
Comments	Computers usually suck! Machine labs have worn out equipment. Computer lab technicians know less about computers than I did. I would like to see <u>one</u> computer lab that is open just for "open lab". It sure is difficult to get anything done when your interrupted by a class that needs the lab. I would like to see more "hands on" related equipment which would further enhance our education. New Technology - NEED SOME. Could update equipment Need more modern equipment, computers, & software. Machines are old and worn even with proper maintenance it is hard to hold some of the tolerances that are required. Technology grows faster than schools can afford and it is difficult for the school to keep up with industries.

Survey results for MFGE seniors (cont'd)

6. **What is your impression of the Manufacturing Engineering Technology program course of study?**

Very Favorable	6
Favorable	12
Neutral	1
Unfavorable	0
Very Unfavorable	0
Comments	The broad overview allows the student to chose an area of specific interest in industry (ie. machining, quality control, process planning, automation). Prepared me very well for Industry Best on Campus! More plastics would be good. The program has done a good job preparing us in the work force.

7. **What are your plans after completing your B.S. Manufacturing Engineering Technology degree?**

Go to work	12
Go to work and attend school part-time	7
Stay in school and enter a M.S. degree program	0
Enroll in another B.S. program at Ferris State University	
Transfer to another university	1
If so, where: University of Iowa MBA.	
Undecided	0

Evaluation/summary of seniors' comments:

- 83% of the on-campus seniors completed this survey (19 of 23). Only one of the off campus evening students submitted a response.
- Geographically, the group is composed of students from the Lower Peninsula, the bulk of who are within 1-1/2 hours driving distance from Big Rapids. External transfer students make up 48% of the respondents.
- Counselors, parents, and teachers had the greatest influence on their decision to enter the program and to come to Ferris State. The application/admission/financial aid/registration process received a neutral to very favorable rating by 90% of the respondents.

- The overall impression of the program and program faculty was "favorable" with the program being skewed to the "very favorable". The students feel that they have been well-prepared.
- The impression of the laboratory facilities, although not particularly great, was better than expected, as the MFGE program does not have its own facilities. What is available is shared or borrowed from other programs. Of particular note is that the seniors, after having worked with the equipment for two years and completing their internships, were less pleased than the juniors, who had less time on the machines.
- The majority of this group plans on going straight to work. 40% plan on continuing their education.

SECTION 5

FACULTY PERCEPTIONS

A. INTRODUCTION

<u>Faculty perceptions:</u> The purpose of this activity is to assess faculty perceptions regarding the following aspects of the program: curriculum, resources, admissions standards, degree of commitment by the administration, processes and procedures used, and their overall feelings. Additional items that may be unique to the program can be incorporated in this survey.

This assignment of Program Review was divided into 3 distinct separate sub-assignments as follows:

- MFGE Faculty Perceptions of the MFGE Program
- Faculty Perceptions of the +2 BS MFGE Program of the Various AAS Programs that ladder into the MFGE Program
- Non-MFGE Faculty Perceptions of the MFGE and MATL prefixes that are technical support classes that are included in their programs. These include AAS and BS Degrees

The survey instruments are included in Appendix F.

B. SURVEY RESPONSES

1. <u>MFGE Faculty</u>

Analysis of the MFGE faculty survey showed the following:

- The MFGE program is consistent with the FSU Mission Statement and College of Technology objectives and goals.
- MFGE program faculty strongly support the MFGE program.
- MFGE BS graduates are highly paid and easily find employment in their field of study.
- Employers of BS MFGE graduates rate the quality of their education as high when compared to graduates of other institutions.
- The cost of administration of the MFGE program is low compared to other FSU College of Technology BS programs.
- The equipment and facilities are inadequate for a quality program and the faculty were divided on the amount of FSU administration support for the program.
- Faculty perceptions of current MFGE students' evaluation of the program are divided, lack of up-to-date equipment and facilities being a major concern. Having to schedule BS coursework after AAS classes have been scheduled demonstrates a lack of priority given to BS degrees.

- The academic content of technical support classes is acceptable, however, additional equipment and facilities would provide higher quality classes.

2. AAS Degree Faculty Perceptions of the MFGE BS Degree

   Analysis of the survey of AAS program faculty whose students enter the MFGE program showed the following:
   - The MFGE program is consistent with the FSU Mission Statement and College of Technology objectives and goals.
   - Have mixed perceptions on amount of support of the program by FSU administration.
   - Agree that the costs of administration of the MFGE program is inexpensive when compared to other FSU College of Technology BS degree programs.
   - Disagree with the statement that current equipment and facilities are sufficient to support a high quality program.
   - Depending upon their AAS degree, their perception is that the MFGE BS adds significant value to the AAS degree. It is comparable to other BS options and is easy to articulate into the program.
   - Wide variation exists in the question regarding how the MFGE +2 degree correlates with the expectations of the AAS Advisory Board expectations.

3. Related-Program Faculty Perceptions of MFGE and MATL technical support classes provided by MFGE faculty

   Analysis of the various program faculty perceptions showed the following:
   - With one noted exception (HET & HSET) the faculty of the program tended to agree that MFGE and MATL coursework met their program objectives and student goals.
   - Wide variation existed in responses, with an overall trend toward agreement that MFGE and MATL technical support classes:
     a. were coordinated with program needs
     b. were effective as currently instructed
     c. use equipment and facilities that should be updated
     d. meet their student needs with respect to time, delivery, and number of sections offered

NOTE: Meetings should be scheduled with program faculty and MFGE faculty to resolve problems that were discovered with this survey.

SECTION 6

INDUSTRY ADVISORY BOARD PERCEPTIONS

A. INTRODUCTION

Industry advisory board perception: The purpose of this survey is to obtain information from the members of the program advisory committee regarding the curriculum, outcomes, facilities, equipment, graduates, micro-and mega-trends that might affect job placement (both positively an adversely), and other relevant information. Recommendations for improvement must be sought out from this group.

The MFGE program has an active Industry Advisory Board (IAB). They meet with MFGE program faculty and administrators on an annual basis. Current board membership is listed in Appendix G.

B. SURVEY AND RESULTS

Of the eleven current members of the MFGE program IAB, one was just appointed to the position, and, not having attended any of the annual meetings yet, politely declined to respond. Five of the other ten could not be contacted during the survey period, being on vacation, extended business travel, or having moved to new companies. A representation of survey form sent to the IAB members and the results are combined in Table 6-1.

Table 6-1
Percentage of responses to IAB Survey Questions

	Strongly agree	Agree	Disagree	Strongly disagree
1. The Manufacturing Engineering Technology Program provides education and training essential to many Michigan industries.	80%	20%		
2. The Manufacturing Engineering Technology Program provides skills useful to your company.	80%	20%		

		Strongly agree	Agree	Disagree	Strongly disagree
3.	Your company would hire a Manufacturing Engineering Technology Program graduate.	**60%**	**40%**		
4.	The Program curriculum is appropriate to industry needs.	**40%**	**60%**		
5.	The Program could be strengthened by building more lab experiences into the curriculum.	**40%**	**40%**	**20%**	
6.	ABET certification should be pursued provided that the core curriculum is not compromised.	**25%**	**75%**		
7.	A masters degree program at Ferris State would fulfill the need for advanced studies in Manufacturing Engineering.	**60%**	**40%**		

C. COMMENTARY

These results were predictable, given the close working relationship that the MFGE program has with its IAB. Questions 5, 6, and 7 show support for future endeavors of the MFGE faculty.

SECTION 7

LABOR MARKET ANALYSIS

A. INTRODUCTION

Labor Market Demand Analysis: *This activity is designed to assess the marketability of future graduates. Reports from the Department of Labor and from industry are excellent sources for forecasting demand on graduates.*

Manufacturing Engineers are involved in planning, directing and coordinating the various elements of design, materials, processes and control of manufacturing operations.

It must be borne in mind that the knowledge/skills required in manufacturing engineering technology have grown and developed over time. Individuals with backgrounds in industrial engineering, mechanical engineering, industrial or operations management, etc., hold many positions in the field.

Representative activities Manufacturing Engineers are:

- Analyze and plan work force utilization, space requirements and workflow
- Develop step-by-step methods for making products
- Design the layout of equipment and workspace for maximum efficiency
- Decide when and where to use robots, computer-aided design (CAD) and computer-aided manufacturing (CAM)
- Recommend changes in the design of a product to make it easier or less costly to produce
- Confer with management on production capabilities, schedules and problems
- Determine product specifications
- Arrange for the purchase of equipment, materials, and parts evaluating them according to specifications and quality standards
- Estimate production times and determine how many workers are required to meet production schedules
- Design racks, bins, or other containers that protect parts and insure quality

Since Manufacturing Engineers cannot be experts in all manufacturing systems specialties have evolved, such as: Standards Engineers, Plant Layout Engineers, Production Planners, Tool Planners, etc.

Manufacturing Engineers are members of several professional organizations, such as the Society of Manufacturing Engineers (SME), the American Society for Quality, the International Society of Productivity Engineers (ISPE), the Institute of Industrial

Engineers (IIE), the Society of Automotive Engineers (SAE), the Association for Facilities Engineering, and the American Society of Mechanical Engineers (ASME).

B. JOB MARKET OUTLOOK

Manufacturing accounts for approximately one-fourth, or 25% of the Gross Domestic Product.

Employment is expected to increase about as fast as the average for all occupations through the year 2005. Manufacturing jobs are concentrated in urban areas.

Manufacturing Engineers are central to more efficient, higher quality production. Courses in manufacturing processes, advanced mathematics, quality certification processes and standards, technical writing, and CAD/CAM coupled with fundamental understanding of physical processes enable the Manufacturing Engineers to handle many diverse roles.

Demand for Manufacturing Engineers in Michigan is dependent on both the state and national economy and in particular the state of the automotive industry. The continued expansion of automated manufacturing processes, the increased recognition of the importance of being internationally competitive through increased productivity and cost reduction, in both industrial and non-industrial settings, the need to conserve energy and solve other environmental problems continue to create employment opportunities for graduates.

Ferris Manufacturing Engineering Technology graduates have enjoyed 100% placement in recent years. Starting salaries vary by industry. New graduate salaries in 1997 averaged $45,500. Nationally the median earnings for Manufacturing Engineers exceed $50,000 with senior management earnings in the field over $100,000.

SECTION 8

FACILITIES AND EQUIPMENT

A. INTRODUCTION

Evaluation of facilities and equipment: An analysis of present facilities and equipment as compared to program needs must be conducted. This analysis should also include an assessment of the availability to the program of technologies used in the workplace.

The facilities and equipment available to the Manufacturing Engineering Technology students for use in program course work are discussed and displayed in the attachments. The specific references include the following:

- Descriptions of existing course work that require lab space and equipment
- Descriptions of changes in lab work given adequate space and equipment where available.
- Computer facilities
- A comparison between Ferris' MFGE program's facilities and equipment and two other schools (Central Michigan University and the University of Wisconsin at Stout)

B. BACKGROUND INFORMATION

There are several variables that the review panel should be aware of regarding the status of the manufacturing program's "facilities and equipment." A brief review is given here.

It must be understood that the Manufacturing Engineering Technology program does NOT have any facilities it can call its own. The limited availability of others' labs and equipment is appreciated, but seriously impinges on the scope of project work.

There is a consensus amongst the faculty that the lack of laboratory facilities and equipment affects pedagogy. The Industrial Advisory Board does not share this view entirely. They feel our graduates, as they currently are, far outpace their competition in the manufacturing engineering arena, who traditionally come from 4-year mechanical engineering programs. Nevertheless, they do recognize that hands-on experience is better than simple paperwork projects.

It was the intent of Jensen E. Nicks, who developed the BS Manufacturing Engineering Technology degree at Ferris, to design the curriculum within the context of a production setting. For whatever reason, he was told to begin the program and was assured that a productivity lab would be added later. But, due to the success of the first couple of graduating classes, those persons in positions to authorize the development of a productivity lab felt there was no need for one since students were doing better than expected without one. Given 20/20 hindsight, this only supports the position that academia at that time was devoid of anything remotely close to the industrial requirements for manufacturing engineers.

All other Ferris BS Engineering Technology programs requiring lab facilities have them. The BS Plastics Engineering Technology facilities, BS Welding Engineering Technology laboratories, and the new National Elastomer Center are examples of how Ferris has committed lab space and equipment to these programs. Consider for a moment where the Ferris Plastics program would be with regard to its national recognition without a laboratory of its own.

It must be noted that this lack of lab facilities is not without advantage to the MFGE program. Necessity being the mother of invention, the lack of facilities and equipment has given rise to an incredible amount of creative ingenuity on the part of faculty in designing meaningful lab experiences for students. However, the limit to such creativity is not asymptotic and real limits are being approached.

Our ability to recruit students, either from on-campus 2-year programs or from other schools, is greatly diminished. Each fall the College of Technology holds "Parents' Day" events in conjunction with Homecoming. It is good to see other programs showcase their facilities and equipment. This aids those programs in many tangible and intangible ways. The manufacturing program would like to be able to showcase itself to the world as well. Unfortunately, we have no equipment and facilities to show.

C. EXISTING AND PROPOSED LAB ACTIVITIES

The following is a list of courses in the MFGE program either already have or should have dedicated lab periods that are under-supported or not supported at all with lab space and equipment. The designation "paperwork lab" indicates the exercise is not hands-on; rather, they are basically group or individual homework assignments. The designation "hands-on" indicates the students are actually performing a lab assignment on equipment even though that equipment belongs to another program area. The proposed lab activities listed are abbreviated for the sake of space in this report. Lab facilities dedicated to the MFGE program would, of course, also be used to benefit courses for all related programs as well.

Course Name	Existing Lab Activity	Proposed Lab Activity
MFGE 311 - Industrial Engineering	• Conduct stop watch time studies primarily on video tapes with one experience time studying a production operation in the machine	• Conduct stop watch time studies in a production setting • Design and test ergonomic work stations • Apply actual IE tools in

Course Name	Existing Lab Activity	Proposed Lab Activity
	shop. • Paper work labs that have students using IE tools on fictitious scenarios.	a production setting. e.g., right hand/left hand; process flow analysis, etc..
MFGE 313 - Computer Applications for Manufacturing Engineers	• Office automation-level assignments running on PC platforms	• Simulation and engineering analysis applications to support other MFGE coursework on workstation platforms
MFGE 321 - Metrology	• Paperwork gage design project (gage does not get built) • Desktop Gage R&R studies using sample parts from industry	• Specify gages for production, then test them under production conditions. • Develop process control plans and test them out in production. • Conduct Gage R&R studies on production gages on real production parts • Propose and carry out gage redesign work on gages failing R&R criteria
MFGE 322 - Production Processes	• None	• Run various pieces of production equipment being discussed in lecture. Simple project from each area.
MFGE 324 - Tool Engineering	• Design a fixture (concept only) • Design a set of tools (concept only) • Conduct two machinability studies in the Manufacturing Tooling machine shop	• Build and test workholding fixtures • Build and test a set of perishable tools • Conduct machinability studies on production type equipment

MFGE 342 - Statistical Process Engineering	• None	• Conduct capability studies on actual production equipment • Design and test statistically based process control plans
Course Name	Existing Lab Activity	Proposed Lab Activity
MFGE 411 - Principles of Process Planning	• Manufacture an assembly as part of a semester-long project in the MFGT program lab across toolroom-type equipment. (note that the availability of this lab is diminishing as that program increases enrollment)	• Manufacture an assembly as part of a semester-long project that involves more types of processes other than strictly material removal processes. • Utilize production equipment as opposed to strictly toolroom-type equipment.
MFGE 421 - Automation and Systems Design	• Paperwork design labs	• Build and test a completely automatic assembly system.
MFGE 422 - Manufacturing Facilities Planning	• Paperwork design labs	• Design, analyze, and simulate material handling and work station layouts in a production setting
MFGE 423 - Engineering Economics	• None	• Incorporate life cycle costing principles to manufacturing systems that the students design and construct
MFGE 442 - Design of Experiments I	• None	• Design and conduct industrial-type experiments for the purpose of trouble shooting and/or modeling manufacturing processes

D. BENCHMARK FACILITIES

Two other schools were visited to gain insight as to their commitment to their manufacturing engineering programs. A very brief synopsis is given about each.

Central Michigan University, Mt. Pleasant, MI. Faculty visited CMU in June of 1998. CMU initiated Manufacturing, Mechanical, and Electronics Engineering Technology degrees (not simply teacher training) in 1990. Over the past seven years, CMU has graduated 765 students across all three program areas (a breakdown by program was not available as of this writing). These programs are housed within a technology center that contains all the necessary machining, foundry, design, and testing labs to completely support their program needs.

University of Wisconsin-Stout, Menominee, WI. Faculty visited UW-Stout in August of 1998. Stout initiated an ABET-accredited Manufacturing Engineering program in 1993. The first graduating class exited in the spring of 1998. Placement was 100%. UW-Stout's program is fully supported with extensive labs and equipment. Faculty are required to have industrial experience and are very savvy. Students in that program are currently doing most of what is outlined under the column heading "Proposed Lab Activities" in the "Existing and Proposed Lab Activities" shown above. UW-Stout's program is now where we would like to be.

E. SUMMARY

It is the consensus of the Ferris MFGE faculty that our facilities and equipment *do not* meet either the pedagogical or aesthetic needs of the program. Moreover, given the rise of competition from inside and outside the state, without the addition of needed facilities and equipment, the manufacturing program at Ferris as we know it will rapidly decline.

SECTION 9

CURRICULUM EVALUATION

A. INTRODUCTION

Curriculum review. The purpose of this activity is to determine through a comprehensive review of the curriculum whether it meets the needs of the market.

Our original plan was to compare the MFGE program to both TAC of ABET (Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.) and SME (Society of Manufacturing Engineers) Curriculum 2000 criteria for programs within out field. However, as the Curriculum 2000 criteria are being superseded by a projection aimed even further out, and ABET recently updated their criteria in response to some input from us and others, we restricted our analysis to current ABET regulations. A bonus to this decision was that, since almost all of our competitors are now ABET-accredited, this would also serve as another benchmark against them as well.

The TAC of ABET standards for curricula in manufacturing engineering technology are developed in partnership with the SME. Full copies of the most recent versions of the general criteria and criteria for manufacturing engineering technology are reproduced in Appendices H and I respectively.

B. CURRICULUM REVISIONS NECESSARY FOR TAC OF ABET ACCREDITATION

Based on our self-review, certain changes will be necessary to align the MFGE program with the TAC of ABET criteria. Some are within MFGE-program faculty purview; others will require higher-level actions. Below are the sections with which we deem ourselves to be possibly or definitely non-compliant. Rather than reproduce all criteria in full in this section, only the "trouble spots" are shown (main points of contention are underlined), followed by brief commentary.

1. General Criteria for All Engineering Technology Programs

   Problem:
   II.A.3.b. Evening and Off-Campus Programs -- Evening and off-campus programs may be accredited as integral with the regular on-campus day program, if they follow the same curriculum, use the same or equivalent laboratory facilities and equipment, and are subject to the same supervision and control of academic standards. The institution must demonstrate that evening and off-campus programs are conducted to the same standards of subject matter coverage and rigor of student work and grading.

- Debate exists over whether the laboratory facilities used by the MFGE program at the ATC (primarily machine shop and computer labs) are equivalent to those on the main campus, as well as over the level and quality of support by the ATC personnel for FSU program areas.
- All responsibility for advising of ATC students was taken away from MFGE faculty by a previous College of Technology interim dean at the request of ATC administration, after MFGE faculty questioned the validity of several admissions, substitutions, and waivers initiated by ATC administration.

Problem:
II.A.12.a. Caution and discretion must be exercised by institutions in all publications and references to avoid ambiguity or confusion among engineering technology, engineering and engineering-related specialties. TAC of ABET will not accredit a program in engineering technology if the institution makes the claim that the program is intended to give its graduates the equivalent of an engineering education as defined by ABET, or improperly uses the term "engineer" or "engineering" in any of its official publications. Where confusion exists, the institution must take p V.B.2. Accreditable baccalaureate programs must be characterized by the following minimums in course requirements:

- We currently have five courses that use a form of the term "engineer" rather than of "engineering technology" in their title (i.e., MFGE 311 - Industrial Engineering, MFGE 313 - Computer Applications for Manufacturing Engineers, MFGE 342 - Statistical Process Engineering, MFGE 324 - Tool Engineering, and MFGE 423 - Engineering Economics). In addition, two courses for related programs (MFGE 351 - Intro to Industrial Engineering and MFGE 451 - Intro to Plant Engineering) follow the same naming convention. Renaming the courses would solve this problem.

Problem:
V.B.2.c.(regarding curriculum makeup) Twenty-four semester hour or 36 quarter hour credits of an appropriate combination of basic sciences and mathematics of the type, level, and subject coverage specified in these criteria and applicable program criteria. The basic sciences component must include at least eight semester hour or 12 quarter hour credits in areas specified in section V.C.4.b. below. The mathematics component must include at least 12 semester hour or 18 quarter hour credits in areas specified in section V.C.4.c. below. The remainder of the requirement may be met by appropriate course work in either basic sciences or mathematics.

- Given the vagueness of projecting back to freshman level coursework from a +2 program, we meet the minimum requirement of 12 credits of math (we require through applied calculus, which brings with it college algebra and trigonometry), frequently meet the minimum science requirement of 8 credits of science (we require at least 7 credits of science including a physics course with lab and recommend a second physics course or a chemistry course), but do not meet the requirement of 24 credits of math and science combined. To add either another math or science course to our present configuration, we would need to drop a technical course to stay under the Ferris cap for credits required in a BS program.

Problem:
V.C.6. Computer Competency --- Engineering technicians and technologists are dependent upon the computer to effectively perform their job functions. It is therefore essential that students acquire a working knowledge of computer usage. Instruction in applications of software for solving technical problems and student practice within appropriate technical courses is required for all programs. Additionally in Baccalaureate degree programs, instruction must be included in one or more of the computer languages commonly used in the practice of engineering technology. Following formal instruction or demonstrated proficiency in computing skills, baccalaureate students should gain experience using programming skills in technical courses to an extent appropriate for the discipline.

- The only traditional programming language instruction MFGE students receive is a unit on QBASIC in the MFGE 313 - Computer Applications for Manufacturing Engineers course that satisfies all other requirements of course. Considerable debate exists within the TAC structure on whether or not *any* computer language is indeed still "commonly used in the practice of engineering technology", so this requirement may change in the future.

Problem:
V.E.2. Upper-division programs generally accept students from TAC of ABET accredited associate degree programs. Students from nonaccredited associate degree programs should have appropriate validation of their work. It is expected that those students with deficiencies in their background preparation for the upper-division programs will be required to remove those deficiencies. In all cases, the accreditation process is intended to ensure that the graduate has achieved a level of competence expected in a baccalaureate program. Equivalence of courses and equivalence of credit hours must be determined by the receiving institution.

- The Ferris MFGE program accepts students from any NCA-accredited manufacturing-related AAS program. Two of the three feeder programs at Ferris, the Tool Design & Technical Drafting AAS program and the Manufacturing Tooling Technology AAS program, are presently unaccreditable under TAC of ABET, and there is not enough time in our +2 program to round out experiences missed in the first two years and add sufficient value on top of that.

Problem:

V.F. Faculty
This section of the criteria relates to the technical faculty members' adequacy in credentials, numbers, and competence. The technical faculty, which may be the single most important factor in an educational program, will be evaluated individually and as a whole. For those programs which incorporate evening or off-campus offerings, the evening and off-campus faculty members are considered as part of the overall program faculty and must satisfy the provisions of this section of the criteria. Strong programs will have technical faculty members whose qualifications exceed what is described here as "basic credentials."

- Some adjunct faculty at the ATC, while specific subject matter experts, have not met basic requirements.

Problem:
V.F.1. Each program must have appropriately qualified technical faculty members. Basic credentials are prescribed to assure the program is appropriately quantitative in nature and includes proper engineering and industrial emphases. A technical faculty member who has the following qualifications is viewed as having basic credentials with regard to technical competence, degree level, and industrial experience. Basic credentials consist of three years of relevant industrial experience and one of the following:
V.F.1.a. A master's degree in engineering or engineering technology, which is considered as the appropriate terminal degree.
V.F.1.b. A master's degree in a closely related field if the degree is primarily analytical and the subject clearly appropriate, e.g., a degree in physics for certain areas of electronics.
V.F.1.c. Professional registration and a master's degree.
V.F.2. In exceptional cases there may be technical faculty members who satisfy the intent of the above minimums without literally satisfying the criteria. TAC of ABET may recognize these exceptions if the institution convincingly demonstrates the equivalence.
V.F.3. Technical faculty members not satisfying paragraph 1 must have at least a bachelor's degree in an appropriate science or engineering-related field. Faculty members teaching the technical skills courses are not required to have advanced degrees but are expected to be artisans or masters of their crafts. However, they should represent only a small fraction of the total engineering technology faculty.
V.F.4. The number of faculty members needed in a program depends on the number of students in the program, the portion of students in evening or co-op programs, other duties assigned to the technical faculty and the teaching support

the program receives from related programs. The number of faculty members must be great enough to provide a breadth of perspective, program continuity and proper frequency of course offerings. In establishing the Full-Time Equivalents (FTE) listed below, faculty members whose primary commitment is to a program count fully for that program unless the institution chooses to divide their time between programs. No single faculty member can total more than one FTE, even if an overload is carried for extra compensation.
V.F.4.b. Each baccalaureate degree program must have at least two faculty members with basic credentials whose primary commitment is to the program and total of at least three FTE faculty members.
V.F.4.c. Each upper-division only baccalaureate degree program must have at least one faculty member with basic credentials whose primary commitment is to the program and a total of at least two FTE faculty members.
V.F.5. Not only does a technical faculty require minimum numbers to adequately carry out its task, the group also must have balance, variety, and overall strength. For an associate degree program at least one-half of the FTE faculty must have basic credentials. For a baccalaureate degree program at least two-thirds of the FTE faculty must have basic credentials.

- At present, the MFGE faculty group has two members with technical masters degrees, three with education-related masters degrees, and two with business-related masters degrees. All have technical BS degrees plus more than enough industrial experience, and continue to acquire more via consulting, but currently we do not meet the 2/3 ratio.

Problem:
V.F.6. Engineering technology education emphasizes problem solving, laboratories, and technical skills. A sufficient number of faculty members are required to give adequate attention to each student in this environment. The student-faculty ratio depends on the nature of the program and courses, but should not exceed the institutional ratio in science-related areas. Student-faculty ratios for non-technical studies should follow normal institutional patterns.

- For the 1996-97 academic year, MATL- and MFGE-prefixed courses generated 470.00 and 456.47 SCH/FTEF respectively. These were lower than such mainstream science areas as geography (779.62), astronomy (668.27), chemistry (636.03), physics (627.74), and biology (614.87), but higher than physical science (432.81), geology (398.86), and industrial chemistry technology (156.92) (source: 1993-97 Productivity Report). Related courses, with their swelled enrollments, taught by MFGE faculty mask the effect of providing more personalized instruction to MFGE majors.

Problem:

V.F.7. Each accredited program must have a full-time faculty member assigned as department head, program coordinator, or similar term designating leadership responsibility. This faculty member should have basic credentials.

- Our present program coordinator, who receives a one-half load allowance for his coordinating duties, has a technical BS degree and an education-related masters degree.

Problem:
V.F.9. The field of technology is changing rapidly. Thus, the currency of material being taught and the people teaching the material are of paramount concern to TAC of ABET. Faculty members must maintain current knowledge of their field and understanding of the tasks industry expects technicians and technologists to perform. Faculty members normally remain current by active participation in professional societies; reading the literature; continuing education; applied research; consulting, and periodic return to industry. The institution should have a well-planned, adequately funded, and effective program for the professional development of its faculty.

- The institution does not have a well-planned, adequately funded, or effective program for the professional development of its faculty. Aside from regular computer user-type sessions sponsored by the Center for Teaching, Learning, & Faculty Development, little almost no technical training is offered to new or existing faculty. Though each college is allotted some professional development funding, on a per head basis the College of Technology could not afford one three-credit course for each faculty member, even if it were allowed to spend professional development funds on for-credit coursework. Most technical updates come from reading literature and spending precious local account money on professional seminars. Unless one wants to acquire a education-related masters degree, which would not apply toward ABET basic credentials, the Ferris employee credit toward on-campus tuition is wasted on this faculty group for professional development.

Problem:
V.K.1. (regarding financial support and facilities) ABET is concerned that financial and facility provisions are adequate as predictors of continuing quality in education and evidence of program stability. Faculty salaries sufficient to attract desirable candidates for open positions and to provide a reasonably stable staff at the institution and within technology departments are a major factor.

- This past year the average starting salary for Ferris manufacturing engineering technology BS program graduates ($45,500) came dangerously close to the maximum starting salary that we could offer our newest faculty member ($48,000), who was hired in January of 1998 and has a masters degree plus years of excellent technical experience. While the salaries of our most senior (and close to retirement) faculty seem adequate when compared to others on the Ferris campus, as a group we are low for the manufacturing engineering field for people with advanced degrees and practical experience. This is the pool from which we must draw new faculty members. Unqualified candidates abound for positions such as these, but it is extremely difficult to convince qualified candidates to join us in Big Rapids when they realize that a) they will take immediate cuts in pay and benefits from their positions in industry, and b) any raises (unguaranteed and locked in for years to come) will not only be smaller than increases in industry, but also smaller than at other schools in Michigan who are seeking the very same individuals. Perhaps an adjustment similar to that which was recently awarded to certain administrators and Michigan College of Optometry faculty members to equalize their pay within their fields could be made to this group.

Problem:
V.K.4. (regarding financial support and facilities) Laboratory equipment and computers should be of the type that would be encountered in industry and practice. Since one of the objectives of engineering technology programs is the development of technical skills, all students should be thoroughly familiar with the use and operation of analytical or measurement equipment common to their major field of study. Experience in the operation of standard or basic shop equipment such as lathes, welders, and engines does not, in itself, meet this requirement.

- This issue is discussed thoroughly in Section 8 of this report.

Problem:
V.K.5. (regarding financial support and facilities) Equipment catalogs, professional magazines, journals, and manuals of industrial processes and practices should be readily accessible and used by technology students in addition to the usual library resources. Students should be familiar with the literature of their technology and encouraged to use it as a principal means of staying abreast of the state of the art in their technological field. Library usage is one indication of faculty interest in developing student skills in locating and utilizing information. Library holdings must include a sufficient number of appropriate books, periodicals, reference books and indexes, and standards documents to support the engineering technology programs. Library holdings may be in paper, microform, or electronic formats. Resources owned by the institution and physically present in the library may be supplemented by other resources, such as electronic information databases and full-text document delivery systems, which are not physically present in the library but which have been licensed for access via online networks.

- Before the recent remodeling projects in the Swan Building, the Manufacturing Engineering Technologies Department had a resource center complete with equipment catalogs, professional magazines, and journals housed in a dedicated study area on the first floor of the Swan Building, and the MFGE program had its own resource room just down the hall for program-specific information. The Plastics program still has such an area in the new National Elastomer Center, and it seems that almost every other department and program in the College of Technology has an enclave strategically positioned somewhere on campus, but the MFGE program students are the equivalents of homeless people with respect to resource material used in their field.

2. Program Criteria For Manufacturing Engineering Technology And Similarly Named Programs

Problem:
a. Technical Sciences. (Amplifies criteria section V.C.1.)
(1) Technical science instruction must be problem-solving oriented with the majority of courses having laboratories to reinforce understanding the principles and applications. Technical science instruction must demonstrate the use of mathematical and basic science principles and computer applications learned in prerequisite or co-requisite study.
(2) For the associate degree, it must be evident to the evaluation team that students are proficient in the following technical science areas: application of computer software, engineering materials, statics and strength of materials, and electronic and electric circuits and devices. Instruction in these areas is required to satisfy the quantitative requirements.
(3) For the baccalaureate degree, it must be evident to the evaluation team that students are proficient in all of the technical science areas enumerated for an associate degree and in at least two of the following areas: fluid mechanics or fluid power, dynamics, thermodynamics or heat transfer, control systems, instrumentation, or microprocessors or data management. Instruction in these areas is required to satisfy the quantitative requirements.

- Depending upon the AAS degree the student enters with, MFGE graduates may or may not meet this requirement. Specifically, Ferris MFGE/MET graduates comply, but Ferris MFGE/TDTD and MFGE/MFGT graduates are not even close, and transfer students may or may not meet these requirements, depending on their original program and institution.

Problem:
c. Basic Sciences and Mathematics. (Amplifies criteria section V.C.4.)
(1) The basic sciences must include physics with laboratory experience.
(2) For the baccalaureate degree, the basic sciences must also include chemistry.

(3) For the associate degree, the study of the concepts of statistics may be substituted for the concepts of calculus.
(4) For the baccalaureate degree, appropriate technical instruction must include applications of statistics.

- The MFGE program requires a lab-based physics class plus one other science course, recommending either a second physics course or chemistry to meet that requirement.

C. FUTURE MFGE CURRICULUM REVISIONS

Many factors will affect future MFGE program revisions. Some include:

- Our regular annual internal reviews to try to upgrade the currency and balance of coursework..
- The allure of various educational foundation grants that are available only for ABET-accredited programs, or programs actively seeking such accreditation.
- Ferris administration's reconsideration of the vow to not be held "financially hostage" to program-accrediting bodies.
- Competition from regional and national programs.
- Availability of computer- and equipment lab space.
- Availability of qualified instructors.
- Market forces and technical developments in this most dynamic field.

An AAS degree in Manufacturing Engineering Technology would enable us almost immediately to be accreditable in our field. As was mentioned earlier, a proposal for such a program (see Appendix B) was initiated several years ago, but the successive rounds of interim or short-term deans in the College of Technology were focused on developing the well-funded elastomer facilities.

Of course, we are open to joint ventures with other programs as well. For instance, while performing this curriculum evaluation, it was noticed that with a few changes (substituting coursework in production control, wage/salary administration, CPM/PERT, and organization/management for a few specific MFGE courses), it would be possible to structure a curriculum accreditable as an Industrial Engineering Technology program under the auspices of ABET and the Institute of Industrial Engineers (IIE) (see Appendix I). Courses meeting these requirements are available from the Ferris College of Business right now. Industrial Distribution is another area for inquiry. Sales and marketing of technical products requires technical prowess. The MFGE program can help provide this. We have the expertise and ambition; we need resources to turn the dreams into reality.

SECTION 10

ENROLLMENT TRENDS

A. INTRODUCTION

Counting students is not a science; it is an art, and a black art at that. The MFGE BS program has no AAS program from which to automatically draw numbers, but this also means that it is impossible to count anyone twice as rumor has it some programs do. MFGE students fall into numerous categories:

- Regularly admitted full-time students - whether from Ferris AAS programs or transfers from other schools.
- Students transferring into MFGE who are still listed with their former program - very common with MET, TDTD, and MFGT students who have not completed all of their AAS requirements.
- Students who are seeking a double major at Ferris - especially a problem with plastics students, who are not allowed to register for plastics courses unless they are listed as plastics majors (therefore they can not be listed as MFGE majors).
- Pre-technical students - taking certain MFGE courses out of the main sequence until they can be formally admitted to the program. It takes these students more than two years to work through two years' worth of courses. Sometimes they are designated as PMFG, and sometimes they are not.
- Part-time students - primarily in Grand Rapids, but becoming more common at the main campus. It also takes these students more than two years to work through two years' worth of courses.

In addition, many main campus MFGE majors are taking the necessary courses to obtain the quality certificate, yet do not show as certificate enrollees. Table 10-1 shows our various counts for the last nine academic years, along with the corresponding enrollment numbers from our on-campus feeder programs. Analysis and discussion follow.

Table 10-1
Student Enrollment in MFGE Program per Academic Year

	Academic Year								
Category	**1989-90**	**1990-91**	**1991-92**	**1992-93**	**1993-94**	**1994-95**	**1995-96**	**1996-97**	**1997-98**
MFGE	47	48	47	56	59	53	49	51	41
Pre-MFGE							4	1	2
METO	30	38	40	42	56	74	60	69	62
QT							5	5	2
QETO								8	7
METO+QETO	30	38	40	42	56	74	60	77	69
MFGE total	77	86	87	98	115	127	118	134	114
MET	56	57	59	66	53	49	59	51	45
TDTD	90	108	99	104	74	74	71	67	71
MFGT	64	67	67	62	42	27	36	62	68
Feeder total	210	232	225	232	169	150	166	180	184

<u>Table 10-1 Key</u>
MFGE - on-campus MFGE majors
Pre-MFGE - on-campus pre-manufacturing students
METO - off-campus manufacturing majors
QT - quality certificate students (started in Fall '95)
QETO - off-campus Quality Engineering Technology majors (started in Fall '96)
MET - FSU Mechanical Engineering Technology AAS program
TDTD - FSU Tool Design & Technical Drafting AAS program
MFGT - FSU Manufacturing Tooling Technology AAS program

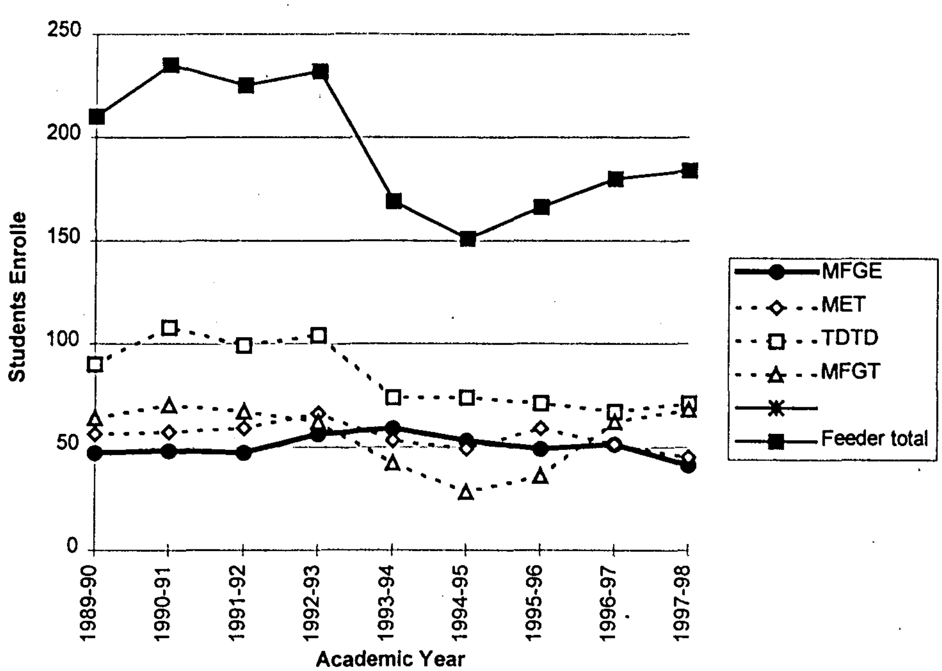
B. ON-CAMPUS ENROLLMENT

Since its inception in the fall of 1976, the MFGE program has started one section of junior-level students each year. Based on available resources, at the beginning the goal was to have 20 to 25 students enter each year from both internal AAS feeder programs such as Manufacturing Tooling Technology (MFGT), Tool Design & Technical Drafting (TDTD), and Mechanical Engineering Technology (MET), as well as transfer students from manufacturing-related programs at various community colleges. The total on-campus program enrollment has stayed remarkably steady and in line with that goal, fluctuating in the last ten academic years about an average of about 50 students total per year between the junior and senior classes.

At the main campus, 20 to 25 new students per year is the upper limit that can be handled with existing resources while maintaining the quality of instruction that accounts for our graduates' phenomenal placement rates and starting salaries. This limit was determined at the outset after considering several factors, not the least of which were available instructors, lab access, equipment, and strategic partnerships with local industry and their ability to host joint projects with students. Pressure on each of these factors has only increased. Expanding enrollment without the proper resources to support the higher numbers would be foolhardy; our hard-won reputation for providing one of the finest products in the region if not the nation could be seriously harmed. Reputations, once lost, are very difficult if not impossible to regain.

Even though our program goal is 20 to 25 solid new on-campus students per year, a few sources of program quota information still show us needing to take in 30 or 32 students per year. Only once in the past ten years has a class been near that number (33 students in what became the graduating class of 1994), and the problems that arose from trying to impart the full-quality experience to a group of that size were a major strain on instructors and resources. After that statistically aberrant year, a College of Technology administrator who is no longer with the university arbitrarily (and some would say capriciously) raised the cap to 32 with no regard for the resources required to support all of the double sections a group of that size would necessitate. Since then, we believe we have most people convinced of the propriety of our 20 to 25 cap, but the "32" still crops up with annoying and frightening frequency.

Figure 10-1
Student Enrollment in On-Campus MFGE- and Feeder Programs for Academic Years 1989-90 through 1997-98



Fluctuations in on-campus MFGE enrollment can be attributed primarily to delayed effects of the drop in campus-wide enrollment. Common sense tell us that when our feeder programs' freshman-level enrollments drop, the MFGE program will experience a downturn in the size of the incoming junior class 2-to-3 years hence. Figure 10-1, based on numbers from Table 10-1, bears this out, showing the feeders programs' boom years of 1991 through 1993 precipitated the MFGE program's bulge from 1993 through 1995. On the flip side, when the TDTD and MFGT programs dipped, it meant that the MFGE program would experience lean years not far down the road.

Reasons for the drop in the supply from the feeders have been well documented (e.g., the numbers of high school graduates is down, starting salaries for MFGT grads is way up, Grand Valley, Central Michigan, and Western Michigan opening similar programs, etc.). This realization does not mean that we accept being at the mercy of others' recruiting efforts, though. We recently began joint recruiting trips to high schools and community colleges with representatives of our feeder programs to encourage students to think several steps ahead in their career planning instead of just one. We expect that we and our feeder programs will benefit from this focused marketing approach.

We expect MFGE on-campus enrollment to bottom out in 1998-99, as the survivors of a somewhat sub-par 1997-98 junior class enter their senior year, Ferris feeder programs graduate the fruits of their recent years' hard work in recruiting, and our own increased recruiting efforts start to pay dividends via more and better transfer students. To even be able to maintain our enrollment while confronted with the increasing competition for a smaller pool of candidates speaks volumes to the recognized quality of our program.

C. OFF-CAMPUS ENROLLMENT

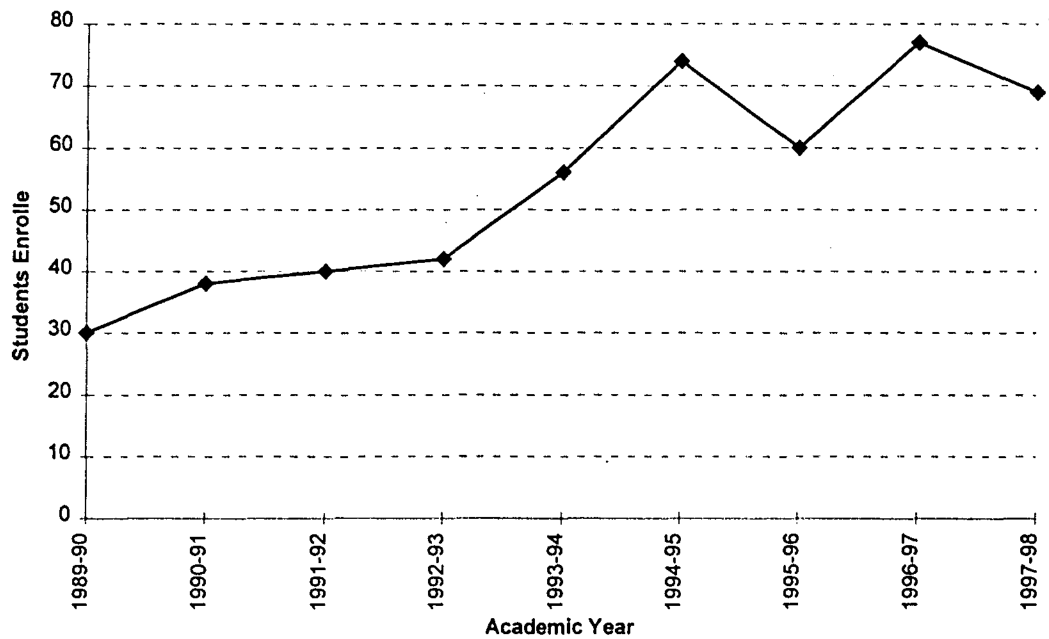
In 1984, the MFGE program was the first Ferris program to be offered to continuing education students in Grand Rapids, first in the North Building of the Grand Rapids Junior College (now Grand Rapids Community College (GRCC)), and later moving into the Applied Technology Center (ATC). As Ferris' vanguard in Grand Rapids, it is still the largest Ferris program still there, thriving while and where other programs have floundered or failed. Demand remains high for MFGE programming, but several challenges must be met head-on to continue growth against growing competition.

In the field of technical education, the Grand Rapids metro area was ignored for far too long. For several years, the MFGE program effectively had the market cornered in the evening course area. In the past few years, though, competition has stiffened considerably. Grand Valley State University moved their Padnos School of Engineering into the L.V. Eberhard Center, and offers full-time and part-time programming in manufacturing engineering. Western Michigan University, with a manufacturing specialty in wood processing, offers evening courses in Grand Rapids at the Eberhard Center, and both day- and evening classes at Muskegon Community College in

Muskegon. Students now have options they did not have before, and many are exercising those options.

Figure 10-2 shows the history of MFGE student enrollment in Grand Rapids for the last nine years.

Figure 10-2
Total Manufacturing- and Quality Engineering Technology Students for Academic Years 1989-90 through 1997-98



The numbers are partially inflated with the inclusion of the special-project metal stamping students, who started in 1994 and will phase out starting in the year 2000, and the eight QETO students in 1995-96 and the seven QETO students in 1997-98. Regardless, the trend shows growth at best and stability at least, with a critical mass of students sufficient to maintain our presence there for years to come.

D. SELF-DETERMINATION

The MFGE program would like to become more self-determining, "masters of our own fate" if you will, with respect to incoming students. We would always welcome internal transfer students from traditional feeder, but believe that there exists a market for a MFGE-AAS program which would help us to stabilize fluctuations in our enrollment by allowing us to recruit directly from high school into four years of FSU MFGE- and related coursework. Details of such a proposed program were discussed previously in this report and a sample program in shown in Appendix B.

SECTION 11

PROGRAM PRODUCTIVITY

A. INTRODUCTION

Productivity information was obtained from the Office of Institutional Studies. The tabulations are organized under University, College, Department, and course prefix headings. The data listings include the following:

- Student Credit Hours (SCH)
- Full Time Equated Faculty (FTEF)
- Ratio of Student Credit Hours per Full-Time Equated Faculty (SCH/FTEF)

Ranked listings for the SCH/FTEF ratio are presented for the following categories.
- College
- Department
- Course Prefix

The final MFGE program figures are result of combining the MFGE- and the MATL course prefixes. Because of the recent College of Technology reorganization, the prefix listings appear in two places in the productivity report; the MFGE program was part of the Manufacturing Engineering Technologies Department in the Fall 1993-Winter 1996 reporting period, and that department joined with the department formerly known as Graphic Arts to become the Design, Manufacturing, & Graphic Arts (DMGA) Department in Fall 1996.

B. PRODUCTIVITY DATA FOR THE MFGE PROGRAM

The data for the MFGE program courses is presented in Tables 11-1 through 11-3.

Table 11-1
Student Credit Hours Generated (MFGE+MATL prefixes)

Year	Summer	Fall	Winter	Fall+Winter
1993-94	n/a	1713	1680	3393
1994-95	188	1881	1494	3375
1995-96	192	1694	1381	3075
1996-97	128	1653	1218	2871

Table 11-2
Full Time Equated Faculty (MFGE+MATL prefixes)

Year	Summer	Fall	Winter	Avg (Fall/Winter)
1993-94	n/a	7.29	8.69	7.99
1994-95	1.50	6.87	7.58	7.23
1995-96	1.17	6.97	7.00	6.99
1996-97	1.75	6.71	5.81	6.26

Table 11-3
SCH/FTEF ratio (MFGE+MATL prefixes)

Year	Summer	Fall	Winter	Fall+Winter
1993-94	n/a	234.98	193.33	428.31
1994-95	125.33	273.80	197.10	470.90
1995-96	164.10	243.04	197.29	440.33
1996-97	73.14	246.35	209.64	455.99

Over the period reported, statistical data for SCH, FTEF, and SCH/FTEF ratios for the MFGE program are as follows:

Table 11-4
Statistical data for SCH, FTEF, and SCH/FTEF Ratio, 1993-97

Category	Mean	Standard Deviation	95% Confidence Interval
SCH	3178.50	251.589	2675.32 to 3681.68
FTEF	7.12	0.713	5.69 to 8.55
SCH/FTEF	448.88	18.545	411.79 to 485.97

The standard deviation calculation assumed that the data were samples of the population, and was calculated using the "nonbiased" or "n-1" method. The 95% confidence interval for mean values is equivalent to ±2 standard deviations.

C. COMPARISON OF MFGE PROGRAM SCH/FTEF RATIO

The productivity report rank orders the colleges, departments, and programs within the university for the 1996-97 (Fall + Winter) school year. The position of the MFGE program in the DMGA Department and in the College of Technology is presented in Tables 11-5 and 11-6, respectively.

Table 11-5
Design, Manufacturing, & Graphic Arts Department
Ranking of Programs by SCH/FTEF Ratio for 1996-97

Rank	Program Name	Prefix	SCH/FTEF*
1	**Manufacturing Engineering Technology (BS)**	**MFGE**	**456**
2	Mechanical Engineering Technology (AAS)	MECH	455
3	Technical Drafting & Tool Design (AAS)	TDTD	338
	Design, Manufacturing, & Graphic Arts Department		***324***
4	Manufacturing Tooling Technology (AAS)	MFGT	315
5	Plastics Engineering Technology (AAS/BS)	PLTE	306
6	Welding Engineering Technology (AAS/BS)	WELD	298
7	Product Design Engineering Technology (BS)	PDET	288
8	Printing Management (BS)	PMGT	213
9	Printing Technology (AAS)	PTEC	197

* - ratio rounded to nearest whole number

This data shows that the MFGE program ranks as best among all DMGA programs, and by far the best of all BS programs. The difference with respect to the welding and plastics programs should be noted because they have large AAS program numbers included in their ratios.

Table 11-6
College of Technology
Ranking of Programs by SCH/FTEF Ratio for 1996-97

Rank	Program Name	Prefix	SCH/ FTEF*
1	Construction Management (BS)	CONM	487
2	**Manufacturing Engineering Technology (BS)**	**MFGE**	**456**
3	Mechanical Engineering Technology (AAS)	MECH	455
4	Civil Engineering Technology (AAS)	CETM	454
	Ferris State University		***447***
5	Automotive & Heavy Equipment Management (BS)	AHEM	421
6	Building Construction Technology (AAS)	BCTM	390
7	HVACR Engineering Technology (AAS/BS)	HVAC	380
8	Architectural Technology (AAS)	ARCH	360
9	Technical Drafting & Tool Design (AAS)	TDTD	338
10	Surveying Engineering (BS)	SURE	335
	College of Technology		***333***
	Design, Manufacturing, & Graphic Arts Department		***324***
11	Electrical & Electronics Engineering Technology (AAS/BS)	EEET	319
12	Manufacturing Tooling Technology (AAS)	MFGT	315
13	Plastics Engineering Technology (AAS/BS)	PLTE	306
14	Heavy Equipment Service Engineering Technology (BS)	HSET	302
15	Automotive Service Technology (AAS)	AUTO	299
16	Welding Engineering Technology (AAS/BS)	WELD	298
17	Product Design Engineering Technology (BS)	PDET	288
18	Heavy Equipment Technology (AAS)	HEQT	285
19	Facilities Management (BS)	FMAN	233
20	Automotive Body (AAS)	ABOD	227
21	Printing Management (BS)	PMGT	213
22	Printing Technology (AAS)	PTEC	197

* - ratio rounded to nearest whole number

This data shows that the MFGE program ranks as second best program overall in the College of Technology, the best of all engineering technology programs, far above the College of Technology aggregate productivity level, and above the university aggregate productivity level.

D. LIMITING FACTORS

The prime constraining factors that restrict improvement in our SCH/FTEF ratio are a) lack of facilities and equipment, and b) the fact that safety and good pedagogical practice limit the size of project- and lab-based courses. To a lesser degree, section sizes for our off-campus classes are sometimes limited because of the rooms allotted for our use at the ATC. We are open to suggestions to improve productivity, but if doing so decreases either safety or quality of instruction, it is no improvement.

SECTION 12

CONCLUSIONS

A. THE MFGE PROGRAM GOALS AND OBJECTIVES ARE CENTRAL TO THE FERRIS MISSION

The MFGE program provides the kind of hands-on technical education central to the College's and University's stated mission. Its graduates have productive careers in industry. Significant numbers of graduates are in leadership positions.

B. THE MFGE PROGRAM IS UNIQUE, AND IS IMPROVING ITS VISIBILITY

Though positioned in what even the most disassociated observer would recognize as the crowded field of manufacturing education, the Ferris MFGE program, with its concentrations on hands-on experiences and team projects as well as its focus on production planning, has established and maintains a strong position in technical education. Companies in Michigan increasingly look upon MFGE graduates as valuable employees, and to Ferris to continue and expand the supply of them. Efforts to increase visibility and highlight our uniqueness are ongoing. ABET accreditation, and adding an MFGE AAS program and an MFGE MS program would improve both visibility and uniqueness.

C. THE MFGE PROGRAM PROVIDES IMPORTANT SERVICES TO THE LOCAL COMMUNITY, THE STATE, AND THE NATION

Services to the state and the nation are provided by MFGE alumni, faculty, and students. The program provides service by generating a supply of well-educated and trained engineering technologists. Graduates advance rapidly into industrial leadership positions and help build and improve the industrial base.

Ferris MFGE graduates help keep Michigan industry strong and prevent the export of jobs to other states or countries where the labor cost is much less. This helps maintain Michigan's tax base, and helps support other job sectors important to Ferris such as construction, education, business, and health services by providing expanded markets for their services. Ferris MFGE grads help make employment of other Ferris grads necessary and possible.

Faculty, along with their teaching duties, serve as consultants and make their knowledge base available to industry. A high percentage of full-time students, aside from their activities as members of professional societies, also help local industry by providing engineering services on a part-time basis while in school.

D. THE MFGE PROGRAM HAS BEEN AND IS IN DEMAND BY STUDENTS

The MFGE program admits one new section of third-year students each fall semester. Demand has been steady for the last decade while competition has increased and the supply of candidates decreased, so, effectively, the MFGE program is getting a higher percentage of the available pool of talent than in the past. Typical incoming enrollment on campus has been in the 20 to 25 range. There exists a network of former students, relatives, friends, employers, and coworkers that spread the word about the value of the MFGE program at Ferris. Many students arrive at Ferris as freshmen with clear educational goals. The MFGE program two years away is often the key element in their plans.

The MFGE program continues to be the most sought after program that Ferris offers in Grand Rapids, specifically mentioned by the Ferris Board of Trustees as a key site for expansion.

E. THE QUALITY OF INSTRUCTION OFFERED BY THE MFGE PROGRAM IS EXCELLENT

There are a number of elements involved that promote the quality of the instruction for MFGE students. These include factors relating to curriculum, laboratory exercises, faculty, and other resources of the College of Technology and the University.

The curriculum is very close to meeting national standards set by TAC of ABET in coordination with both the Society of Manufacturing Engineers (SME) and the Institute of Industrial Engineers (IIE), mostly lacking only adequate support and facilities. These standards are regularly reviewed and updated. The MFGE program undergoes periodic self-reviews to insure that these standards and criteria continue to be met.

The MFGE laboratory exercises, though mostly design oriented, permit the student to enhance their classroom experiences. They learn to work together as teams and yet pull their own weight as individuals. Each term, as well as for their capstone project, they make both oral and written presentations. Ferris MFGE students, as a group, fare much better than students from competing schools on internationally recognized certification exams. Computer usage has become an important part of the MFGE program.

The MFGE faculty are well qualified. Present and past program faculty have had more than ten years industrial experience and are constantly trying to increase their knowledge and experience in the field.

F. THERE IS HIGH DEMAND FOR FERRIS MFGE GRADUATES, AND THEIR PLACEMENT RATE AND AVERAGE STARTING SALARY IS EXCELLENT

Labor market studies show a steady demand in Michigan for technicians and engineering technologists. These graduates provide the technical talent necessary for the capital goods industries in Michigan and in the Midwest. The Ferris Career Planning and Placement surveys show a high demand for College of Technology graduates in all fields.

Holders of BS degrees in MFGE from Ferris, without further education, typically are hired or promoted into positions with the title of Manufacturing Engineer or equivalent, advance rapidly within their companies, and have ample opportunities to change positions if they wish. The most recent university-wide salary survey showed an average starting salary of $45,500 for MFGE graduates, with 100% placement going all the way back to the very origins of the program.

G. THE MFGE PROGRAM PROVIDES ESSENTIAL SERVICES FOR OTHER PROGRAMS

Besides also running the Quality Engineering Technology BS program and the Quality Technology certificate program, the MFGE program provides many sections of courses, both those specifically designed for related programs as well as MFGE-major courses, for a number of other programs. Courses typically provided or open to others include:

- MATL 240 - Intro to Material Science
- MATL 341 - Material Selection Metals
- MFGE 341 - Quality Science Statistics
- MFGE 351 - Intro to Industrial Engineering
- MFGE 352 - Design for Manufacturability
- MFGE 353 - Statistical Quality Control
- MFGE 423 - Engineering Economics
- MFGE 451 - Intro to Plant Engineering

Related programs and their usage of MFGE courses:

- BS Plastics Engineering Technology (MFGE 351, MFGE 353, MFGE 423, and MFGE 451 required)
- BS Welding Engineering Technology (MFGE 353 and MFGE 423 required)
- BS Electrical Engineering Technology (MFGE 353 and/or MFGE 423 required or optional, depending on option)
- BS Operations Management (College of Business) (MFGE 351 and MFGE 451 required)
- BS Heavy Equipment Service Engineering Technology (MATL 240 required; MFGE 313 and MFGE 352 required for manufacturing option)
- BS Product Design Engineering Technology (MATL 341 and MFGE 352 required)
- BS Rubber Engineering Technology (commencing fall 1998) (MFGE 351, MFGE 353, MFGE 423, and MFGE 451 required)

- AAS Welding Technology (MATL 240 required)
- AAS Tool Design & Technical Drafting (MATL 240 required)
- AAS Manufacturing Tooling Technology (MATL 240 required)

In the near future, we expect MFGE 313 to be added to the AAS Mechanical Engineering Technology curriculum, and other programs within and outside the College of Technology to adopt MFGE courses on their checksheets. The MFGE faculty are open to discussing the inclusion of MFGE courses in any program on campus.

H. THE MFGE PROGRAM HAS LESS THAN ADEQUATE LABORATORY FACILITIES AND EQUIPMENT TO MAINTAIN A HIGH QUALITY PROGRAM

The laboratory facilities available to MFGE students include the following.

- Swan Annex machine shop (borrowed from the MFGT program)
- Swan Annex metrology lab (shared with the MFGT program)
- Swan 105A and 105B classroom/computer labs (shared with all other DMGA department- and College of Technology programs)

These laboratories, when accessible, provide a questionably adequate hands-on experience for the student due to lack-, condition-, and quantity of equipment. The high demand on these facilities and the seemingly low priority for the MFGE program with respect to room scheduling preclude our use of them for much beyond the bare minimum time allotted. The creativity on the part of the MFGE faculty to work around these constraints is severely taxed.

Funding remains a problem. The University does not have in place a regular budget for equipment repair and replacement. It also does not regularly budget for capital equipment acquisition. For fiscal year 1999, the MFGE program has been allotted a total of $8,000 for equipment and supplies & expenses combined, of which on September 11, 1998, only $2,800 remained.

The MFGE program, as a "+2" program, does not qualify for any kind of vocational-technical education funds from the state and federal governments. Primarily we rely on local account funding, of which a large portion comes from donations from the faculty members themselves.

I. LIBRARY INFORMATION RESOURCES ARE LESS THAN ADEQUATE

Before the recent remodeling projects in the Swan Building, the Manufacturing Engineering Technologies Department had a resource center complete with equipment catalogs, professional magazines, and journals housed in a dedicated study area on the first floor of the Swan Building, and the MFGE program had its own resource room just down the hall for program-specific information. The Plastics and Rubber programs have such areas in the new National Elastomer Center, and it seems that almost every other department and program in the College of Technology has an enclave strategically positioned somewhere on campus. Fortunately, the is a great deal and growing amount of manufacturing-related information available on the Internet. The MFGE program looks forward with great anticipation to the opening of the FLITE and with high hopes for a prominent position in the much-discussed new technology center.

J. THE COST OF INSTRUCTION FOR THE MFGE PROGRAM IS AN EXCELLENT VALUE

Data show that, with respect to SCH/FTEF, the MFGE program ranks as second best program overall and the best of all engineering technology programs in the College of Technology, far above the College of Technology aggregate productivity level, and above the university aggregate productivity level for all types of programs. Combining our relatively low cost of instruction with the high starting salaries and 100% placement rate of our graduates makes the Ferris MFGE program, if not the best, then one of the best investments on campus.

K. THE MFGE FACULTY ENGAGE IN PROFESSIONAL AND SCHOLARLY ACTIVITIES APPROPRIATE TO THEIR FIELD WITHIN PRESENT BUDGETARY AND PROGRAMMATIC LIMITATIONS

Given that on-campus opportunities are limited in their field, MFGE program faculty are active in campus activities and professional development in the areas of manufacturing engineering. MFGE faculty hold at least their fair share of university-, college-, and department-wide committee positions, and leadership positions in many of those. MFGE faculty participate in professional activities with organizations such as SME, SAE, ASEE, and ASQ, and present papers and deliver seminars at international conferences and meetings.

Continuing education remains a sore spot, with limited opportunity to date in the Big Rapids area, no financial support for for-credit coursework, and limited resources for others forms of faculty development.

L. TURBULENCE AT THE ADMINISTRATIVE LEVEL HAS NOT FATALLY AFFECTED THE MFGE PROGRAM

One promising note in all of the administrative turmoil over the last five years on campus in general and in the College of Technology in particular has been the appointment of an

MFGE faculty member as program coordinator of the MFGE program. This has helped a great deal on the recruiting, advising, and information-flow fronts.

Without reviewing the many faces of College of Technology leadership over the past five years, perhaps the best way to state the effective position of administration regarding the MFGE program is that they have stayed out of our way for the most part and let us do our jobs. The MFGE program faculty are recognized as competent and diligent, requiring little assistance from administration in either day-to-day or long range planning activities. While administration has been occupied with the National Elastomer Center startup, the two failed dean searches, the college's massive reorganization, etc., the MFGE program has forged ahead, staying the course and helping stabilize the department. We now need some help from those offices to move on to the next level of programming.

SECTION 13

RECOMMENDATIONS

In President Sederburg's letter dated September 1, 1998 to the campus community (see Appendix J), he addressed the subject of summer university planning activities. Roundtable discussions resulted in updated long-term strategic issues, goals, and objectives. The five issues identified were:

Issue One:	Ferris State University must strategically grow to survive in the 21st century.
Issue Two:	Ferris State University must improve its position in higher education with more nationally recognized programs of study.
Issue Three:	Ferris State University must attract more resources to grow strategically.
Issue Four:	Ferris State University must improve the quality of its services in order to grow and attract new students.
Issue Five:	Ferris State University must improve and enhance its physical and technical infrastructure for students, faculty, staff, and community.

These five issues have been incorporated into the FSU Comprehensive Planning Document. The MFGE program can play a major role in meeting these objectives, given the proper support. To that end, we make the following recommendations.

A. EXISTING PROGRAM STRENGTHS NEED TO BE MAINTAINED

- <u>Faculty Recruitment</u>

  Over the next three academic years, three of the seven faculty members in the MFGE group either can or will retire. Two of these instructors have over thirty years each in the critical fields of metallurgy and machine tool technology. They would be difficult to replace under normal circumstances, but with the salary and benefit limits imposed on us plus the shear time it takes to get authorization to post and fill a position, we may encounter extreme problems in the near future if we do not get some upfront administrative assistance.

- <u>Computer Laboratory Access</u>

  One of the few visible, tangible enticements that we can show recruits and their parents are the Swan computer labs in rooms 105A and 105B. To use these machines, one need not make appointments at odd hours. Persons responsible for computer support in the College of Technology have plans to cut back the number of computers in the College of Technology, and based on their strategy, the areas accessible to MFGE students would be greatly affected. Until the MFGE program gets its own dedicated computer lab (as some less computer-dependent College of

Technology programs have), we need the present numbers of machines to stay available.

B. SOME PROGRAM AREAS NEED TO BE STRENGTHENED

- Faculty Development

The strengths of the College of Technology faculty groups are practical experience and the ability to impart that experience to students. This has always been held in higher regard than advanced degrees within the College. Even though Ph.D.s are undeniable attention grabbers, at least in the MFGE area it has proven impossible thus far to find candidates willing to come to Ferris that have both the credentials desired and experience required to fill the positions. To this point we have chosen quite correctly to go with the experienced candidates over the inexperienced. This problem is not peculiar to the MFGE program.

In the engineering/technology fields, there are limited opportunities in this geographical area for furthering one's education, and there a many young instructors in the College of Technology who would jump at the chance to pursue terminal degrees while continuing to teach at Ferris. The dedication they show in staying here rather than leaving for greener pastures should be recognized and nurtured.

The solution could lie in the revival of the type of program launched some fifteen years ago, when a prior university administration recognized the need to and desirability of improving credentials on campus. Rather than take the mercenary approach and just hire different people, that enlightened administration realized that the best way to get exactly the kind of people you want is to grow your own. Through Michigan State University, about two dozen Ferris instructors and administrators went through an MSU Ph.D. program primarily focused in Big Rapids. The program was a great success. Two current Ferris vice presidents owe their qualification for their present positions to the degrees they received through this program, and several outstanding instructors came from that group as well. Now, nearing the new millennium, it is time once again for Ferris to do some more gardening.

With the advent of distance learning and Internet-based instruction, it should be possible to take a significant amount of coursework without disrupting the work we are doing at Ferris. Unfortunately, not much can be done by either an individual or someone merely at the faculty level to initiate such a setup. Michigan Tech already has portions of an applicable graduate program in engineering available to corporate sponsors; if Ferris upper administration members were to contact their counterparts at Michigan Tech, it is likely that an arrangement could be worked out to everyone's benefit.

- <u>Marketing vs Advertising</u>

  Ferris' university advancement personnel, aided very capably by several years of Ferris athletic teams' dominance in their sports, have been able to increase awareness around the region of Ferris itself. The problem lies in that Ferris is such a diverse university, one small core group answering to everyone, even if they know exactly whom to speak to, can not possibly market individual programs to specific customers. The MFGE faculty are grateful for the advertising done on behalf of the entire university, but are more than willing and able to shoulder the full responsibility for marketing the MFGE program if given the resources, and request just that.

- <u>Facilities & Equipment</u>

  From the surveys from all of our customer groups, the MFGE group is doing an excellent job of insulating them from the inadequacies of our lab facilities. However, the insulation is wearing dangerously thin. It is not enough to merely not kill the goose that lays the golden eggs; the goose must occasionally be fed as well.

  When the next wave of building improvements sweeps through the College of Technology, the MFGE program, with its far-reaching influence, should be the both the cornerstone and at the heart of any new facility. This will be necessary just to the state-of-the art facilities put up in recent years by less our capable competitors who now have manufacturing showcases with which to impress those who can't see their lack of substance behind all of the fresh paint and shiny equipment. In the mean time, funding needs to be earmarked to support unit action plans to carry us through until new facilities are provided. Assistance should be provided to those willing to write grant requests to identify proper sources of funding and procuring outside help.

- <u>TAC of ABET Accreditation</u>

  As soon as MFGE program faculty can make adjustments to the program that will meet both TAC of ABET requirements and maintain our traditional and highly desired strengths, we must apply for and gain accreditation. Every year, we become more and more conspicuous by our absence from the list, and our competitors are using the fact that we are not accredited and they are against us in recruiting and fundraising. Resources must be allotted to support these efforts.

- <u>Constancy of Purpose</u>

  For protection of the integrity of our on- and off-campus programs, we recommend that the responsibility for all academic advising of all MFGE students be returned to MFGE program personnel.

- <u>Curriculum Initiatives</u>
  An AAS-MFGE program (to enable ABET accreditation and provide another source of BS program students) and an MS-MFGE program (to upgrade MFGE graduates' skill levels) need to be investigated and put into place as soon as possible. These new offerings, when combined with planned improvements to the existing BS-MFGE program, will solidify our reputation as the provider of the best and most complete manufacturing engineering technology education in the country.

In summary, we hope you appreciated the frank and open discussion of the high- and low-points of the MFGE program. By openly discussing the problems, we hope to come up with solutions to overcome them. We hope you agree that the material presented in this report supports a rating of "Enhance the Program" for the MFGE program. Thank you again for your time and consideration, and please feel free to contact any PRP member for more information.

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

MANUFACTURING ENGINEERING TECHNOLOGY
BACHELOR OF SCIENCE DEGREE
FALL SEMESTER
Curriculum Guide Sheet

NAME OF STUDENT____________________ STUDENT I.D.__________

Total semester hours required for graduation: 75 (MFGT Grads only); 75 (NON-MFGT Grads only)(includes 4 credits for internship)

NOTE: Meeting the requirements for graduation indicated on this sheet is the responsibility of the student. Compliance with this agreement will assure the student completion of the program in the time frame indicated. Your advisor is available to assist you.

THIRD YEAR - FALL SEMESTER			CREDITS	COMMENTS/GRADE
MFGE	311	Industrial Engineering	4	
MFGE	312	CNC & CAM (NON-MFGT GRADS)	4	
MFGE	313	Computer Applications for MFG Engineers	3	
MECH	240	Sta. & Strg. of Mat'l. (MFGT AAS MATH126 conc. or MATH 120)	4	
MFGE	341	Quality Science Statistics (MATH 116 or equivalent)	3	
PSYC	150	Introduction to Psychology	3	
THIRD YEAR - WINTER SEMESTER				
MFGE	321	Metrology	2	
MFGE	322	Production Processes	3	
MFGE	342	Statistical Process Engineering (MFGE 341)	3	
MFGE	324	Tool Engineering (MFGE 313)	4	
MATH	216	Applied Calculus 1 (C- or higher in MATH 126)	4	
Elective		Directed Cultural Enrichment	3	
THIRD YEAR - SUMMER SEMESTER				
MFGE	393	Internship	4	
FOURTH YEAR - FALL SEMESTER				
MFGE	411	Principles of Process Planning (all 300 MFGE courses)	4	
WELD	416	Welding Processes	2	
MFGE	442	Design of Experiments 1 (MFGE 411)	3	
EEET	419	Electrical Controls and Circuits	5	
PHYS	211	Introductory Physics 1 (MATH 116)	4	
FOURTH YEAR - WINTER SEMESTER				
MFGE	421	Automation and Systems Design (EEET 419, MFGE 311, 313)	3	
MFGE	422	Manufacturing Facilities Planning (MFGE 311, 313)	3	
MFGE	423	Engineering Economics (MATH 126)	2	
MFGE	499	Capstone Experience	1	
PLTS	325	Plastic Processes	2	
PSYC	326	Industrial-Organizational Psychology (PSYC 150)	3	
Elective		Directed Cultural Enrichment (200 level or above)	3	

(OVER)

CURRICULUM REQUIREMENTS
MANUFACTURING ENGINEERING TECHNOLOGY
BACHELOR OF SCIENCE DEGREE
FALL SEMESTER

ENTRY CRITERIA:

1. Associate Degree in a Manufacturing-based Technology (or 60) semester hours of college course work including technical courses, general courses, and technical related courses).
2. Application submitted by December 15.
3. 2.75 honor point average in major courses, or faculty approval.
4. 2.50 honor point average in mathematics, through MATH 126 (or equivalent), or completion of MATH 216, or faculty approval.

ADDITIONAL REQUIREMENTS:

1. A material science class (e.g., MATL 240) and a speech class (COMM 121 or equivalent) are required for graduation. It is recommended that these requirements be met in the A.A.S. coursework.
2. Student must be prepared for calculus by Winter Semester of Junior year.
3. All graduating seniors must sit for the S.M.E. certified technologist exam, or faculty approval equivalent during the semester they intend to graduate.

TECHNICAL			CREDIT HOURS
MFGE	312	CNC & CAM	4
MFGE	311	Industrial Engineering	4
MFGE	313	Computer Applications for MFG Eng.	3
MFGE	321	Metrology	2
MFGE	322	Production Processes	3
MFGE	324	Tool Engineering	4
MFGE	341	Quality Science Statistics	3
MFGE	342	Statistical Process Eng.	3
MFGE	393	Internship	4
MFGE	411	Prin. of Pro. Plan	4
MFGE	421	Auto. & Sys. Des.	3
MFGE	422	Manuf. Facilities Plan.	3
MFGE	423	Engineering Economics	2
MFGE	442	Design of Experiments 1	3
MFGE	499	Capstone Experience	1
Technical Related			
EEET	419	Electrical Controls & Circuits	5
MECH	240	Statics & Strengths of Materials	4
PLTS	325	Plastic Processes	2
WELD	416	Production Welding Processes	2

GENERAL EDUCATION			CREDIT HOURS
Communication Competence			
Scientific Understanding			
PHYS	211	Introductory Physics 1	4
Quantitative Skills			
MATH	216	Applied Calculus 1	4
Cultural Enrichment			
Directed Electives			6
Social Awareness			
PSYC	150	Introduction to Psychology	3
PSYC	326	Industrial-Organizational Psychology	3

B.S. Degree Minimum General Education Requirements in Semester Hours effective Fall 1995 enrollment:

Cultural Enrichment Credits - 9
Communications Credits - 12
Social Awareness Credits - 9
Scientific Understanding Credits - 7-8

(OVER)

Revised 6/18/97

Name ____________

SS# ____________

FERRIS STATE UNIVERSITY
GENERAL EDUCATION REQUIREMENTS FOR
B. S. - MANUFACTURING ENGINEERING TECHNOLOGY
EFFECTIVE FALL SEMESTER 1997

COMMUNICATION COMPETENCE **(12 credits)**

	Course	Semester
Required:	ENGL 150	____
	ENGL 250 or 211	____
	COMM 121	____

AND

(a) The three writing-intensive courses in the major (MFGE 324, MFGE 393, and MFGE 421) *or*
(b) MFGE 324, MFGE 421, and one 200-level or higher COMM course (only if MFGE 393 can be waived)

Course	Semester
____________	____
____________	____
____________	____

SCIENTIFIC UNDERSTANDING **(7-8 credits)**

Required: Ferris requirement is two courses (one must have a lab) from the following subjects: ASTR, BIOL, CHEM, GEOG 111, GEOG 121, GEOL, PHSC, or PHYS. The MFGE program requires PHYS 211 as one of those courses, and recommends PHYS 212 or a CHEM class as the other.

Course	Semester
PHYS 211	____
____________	____

QUANTITATIVE SKILLS

	Course	Semester
Required:	MATH 216	____

CULTURAL ENRICHMENT **(9 credits)**

Required: Three courses from the following subject areas: ARCH 244, ARTH, ARTS, COMM 231, ENGL 321, ENGL 322, FREN, GERM, HIST, HUMN, LITR, MUSI, SPAN, and THTR. They must include:

(a) At least one course at the 200 level or higher.
(b) Maximum five credits from music/theater activities.

CULTURAL ENRICHMENT (cont'd)

Recommended: HUMN 216 or HUMN 217.

Course	Semester
____________	____
____________	____
____________	____

NOTE: At least one Cultural Enrichment or Social Awareness course must also count toward the Global Consciousness requirement.

SOCIAL AWARENESS **(9 credits)**

Required: Three courses from the following subject areas: ANTH, ECON, GEOG (except GEOG 111 or 121), PLSC, PSYC, SOCY, and SSCI (except SSCI 100). These courses must include:

(a) Courses in at least two different areas.
(b) One Social Awareness Foundations course.
(c) One Race, Gender, and/or Ethnicity Issues course.
(d) One course at the 300 level or higher.

The MFGE program requires PSYC 326, which meets requirement (c) and (d). The prerequisite for PSYC 326 is PSYC 150, which meets requirements (b) and (c).

Course	Semester
PSYC 150	____
PSYC 326	____
____________	____

NOTE: At least one Cultural Enrichment or Social Awareness course must also count toward the Global Consciousness requirement.

GLOBAL CONSCIOUSNESS

Required: One Global Consciousness course, which may be either a Cultural Enrichment or Social Awareness course.

Course	Semester
____________	____

GENERAL EDUCATION COURSE DESIGNATIONS

CULTURAL ENRICHMENT

ARCH 244
ARTH
ARTS
COMM 231
ENGL 322
HIST
HUMN
LITR
MUSI
SPAN
THTR

SOCIAL AWARENESS

ANTH
ECON
GEOG (except 111 and 122)
PLSC
SOCY
SSCI

ARTH 111, 310, 311, 325
FREN
GERM
HIST 152, 276, 280, 301,
310, 320, 341, 360, 371,
372, 373, 375, 385
HUMN 100, 102, 230, 240,
315, 325, 326
LITR 203, 204
MUSI 221, 232
SPAN 101, 102, 201, 202,
301, 302
THTR 215, 232

ECON 311, 312, 451
GEOG 421, 424

ANTH 310, 320
ECON 331
GEOG 202
PLSC 323, 331, 341
SOCY 225, 340, 344,
345, 373, 443, 460

ANTH 122
GEOG 100, 112

(one of these three courses is recommended for A.A.S. students to fulfill Gen.Ed. requirements)

GLOBAL CONSCIOUSNESS

GEOG 301
PLSC 221, 225, 251, 311
PSYC 226, 231, 241, 310,
325, 326, 331, 342, 410
422, 430
SOCY 230, 242, 341, 361,450

ANTH 121
PLSC 121, 122
PSYC 150
SOCY 121, 122

ECON 221, 222

SOCIAL FOUNDATIONS

RACE, GENDER, AND/OR ETHNICITY ISSUES

4-08-98

Bruce,

Good to talk to you recently! I was happy to find out that you were affecting young people's minds in such a positive way. I've been hearing nothing but good things about Ferris State in general and specifically about you and the other professors in your curriculum for doing such a good job in preparing manufacturing engineers, etc. The hands on experience and the depth of projects sure have put the students in your program ahead of the competition.

-Chris Hoeh; 1997 Spring grad.

I've had an opportunity to compare what Chris was involved with, (projects & assignments) and how it measures up to what GMI (Kettering Univ.) students did for me at GM and I think students at both institutions are receiving comparable education's. My nephew graduated from GMI last spring and he might not agree that other schools are as good but I have seen what a good education can do for an individual and their contribution to any company.

I think I mentioned that I worked at General Motors (Buick Div.) for 13 years in Flint. I had no idea that I would end up here in Southfield seven years ago to work for a small manufacturing company, let alone be working for my father-in-law and brother-in-law. It's been a good experience, an opportunity to apply experience gained from a large company, where I can sink my teeth into multiple areas of responsibility instead of being responsible for one small segment of a plant. Probably the only area that was initially hard to get used to was the traffic and the myriad amount of opportunities for spending money.

To help explain that last comment, obviously cost of living is much higher, but the other side of the coin is that there is so much to do. Its like being in a candy shop and being a diabetic, problem is you have to have an unlimited amount of money to keep up with the requests from wife, kids and even my own yearnings. Ok so learning to say NO has taken on a whole new meaning living down here. All kidding aside there is a lot to do and we have come to the conclusion that simple pleasures are the best - just like being up home - time spent with family, even if it is home, is the best way to enjoy the day.

Even with all of the advantages of being down here in southeast Michigan, Michele and I have been making plans to some day return to the central Michigan [illegible] to live. We have purchased 14 acre[illegible] easant and two miles south on Gil[illegible] family members that were willed th[illegible] e. So it not only has special sentime[illegible] unspoiled land in a 50 mile radius of M[illegible] years and me "retiring" in about [illegible] have John through college, he's attend[illegible] graduated from High School and g[illegible]

air-matic products co., inc.

Don Houghton
Quality Assurance Manager

PHONE: (248) 356-4200
FAX: (248) 356-0738
22218 TELEGRAPH ROAD / SOUTHFIELD, MICHIGAN 48034

FULTON INDUSTRIES, INC.

Quality is our Way of Life

2903 E. Fort Wayne Rd. • P.O. Box 290 • Rochester, IN 46975-0290
Phone: 219-223-4387 • FAX: 219-223-6083

JAMES

August 17, 1998

Mr. Gary Ovans
Ferris State University
915 Campus Swan # 109
Big Rapids, MI 49307-2291

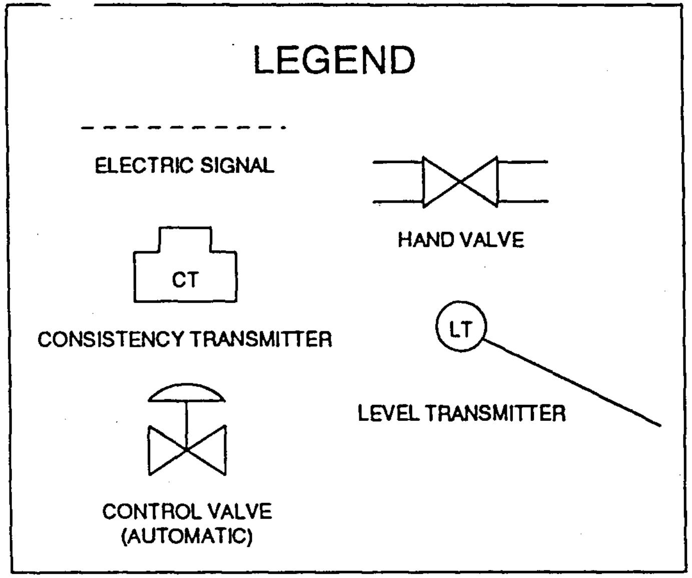
Dear Mr. Ovans:

As a follow-up to my telephone inquiry about co-op programs for engineering or engineering technology students at FSU, I am sending some information about Fulton Industries, Inc.. We are not a large organization but we can offer outstanding real time learning opportunities.

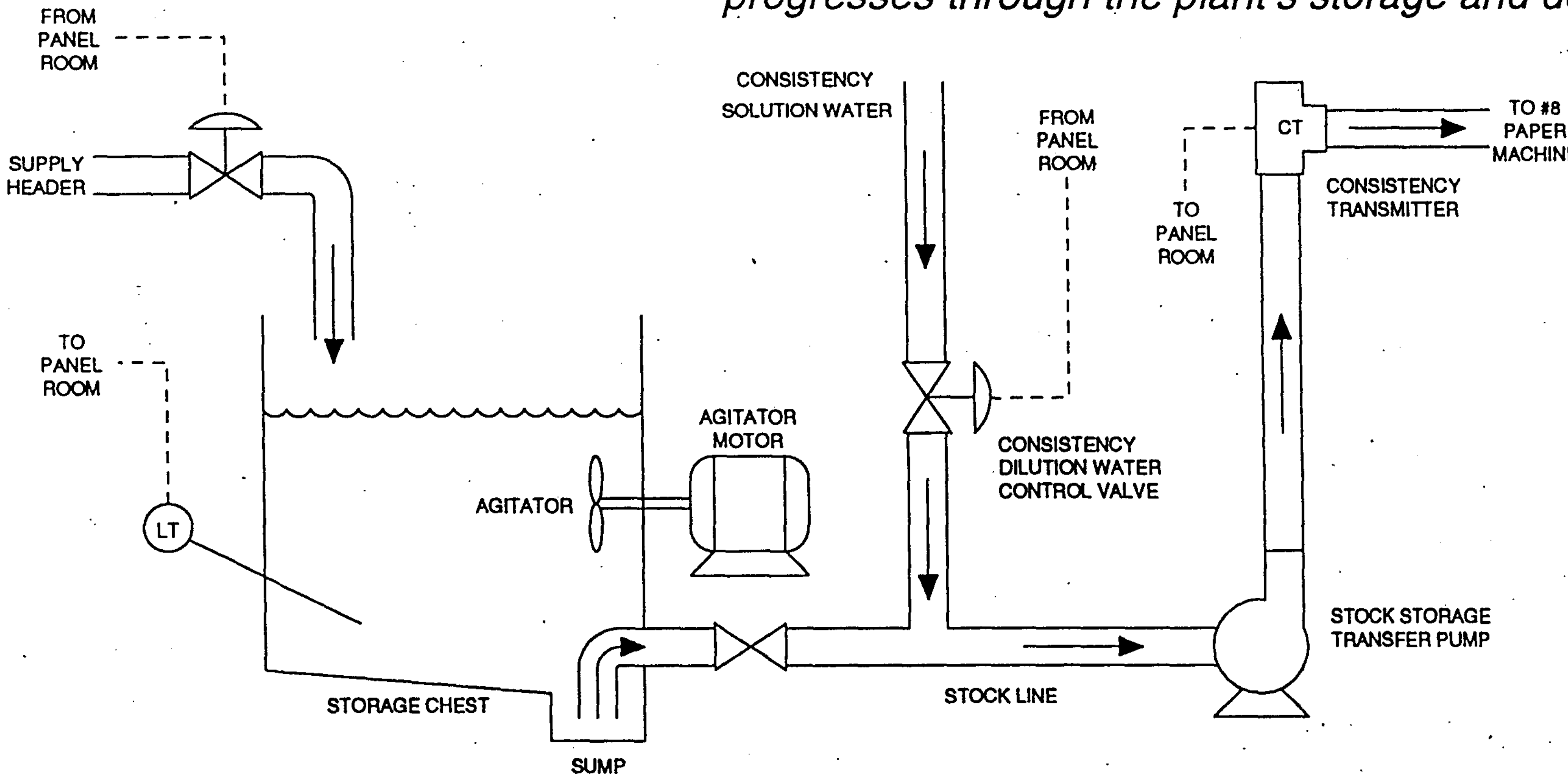
Please forward the information to the individual who is responsible for the co-op programs and ask him or her to call me if there are any questions or if more information is needed.

Sincerely,

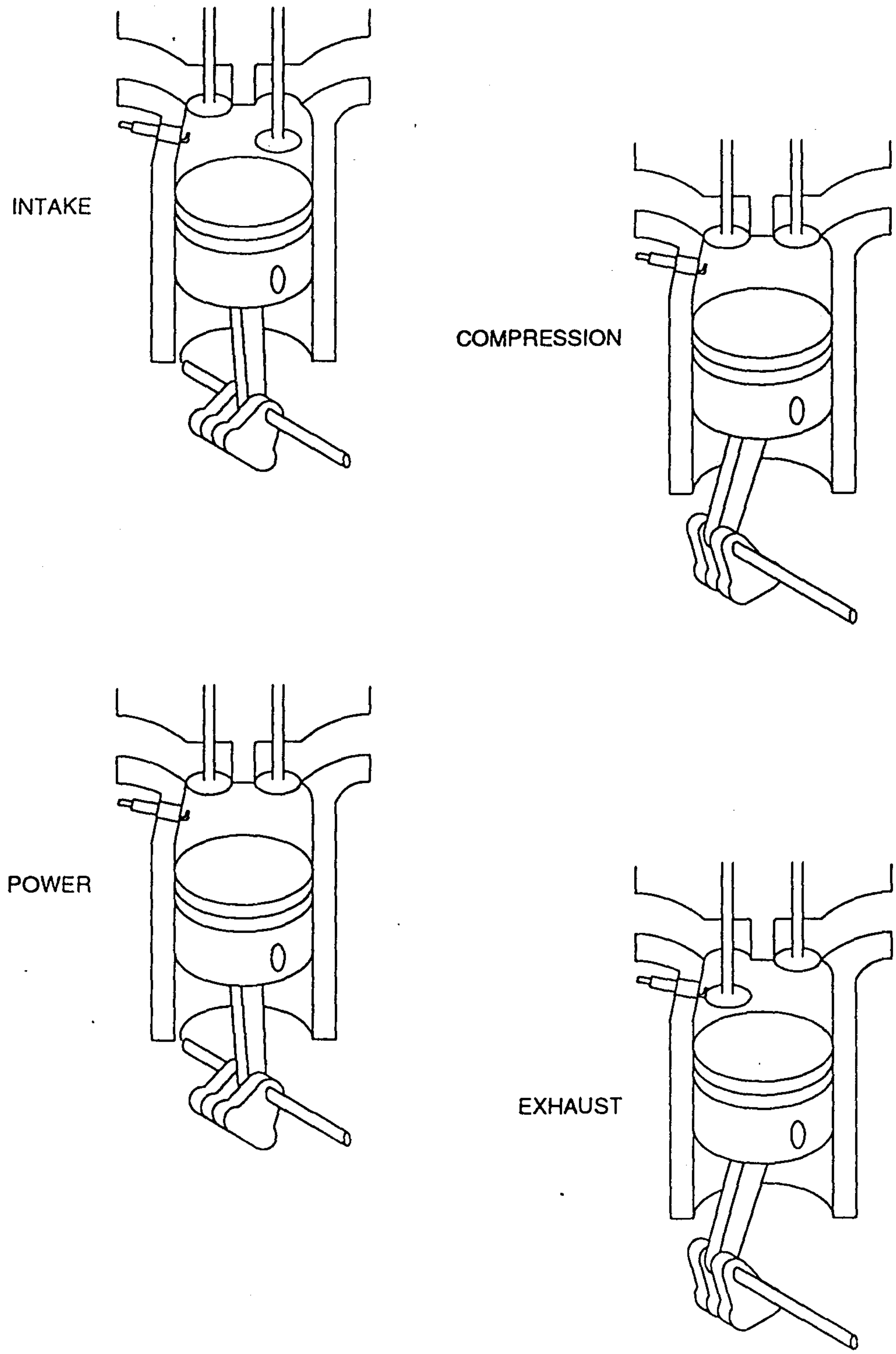
William D. MacPhee
Human Resources Manager



DIRECTIONS: Below is a drawing of a typical arrangeme of equipment in a paper mill. Stock is a solution of water and wood pulp. The stock must be in solution so that it ca be pumped through the pipes. Ultimately, the water will b removed and the wood pulp will be made into paper. The figure below shows a typical storage and delivery system used from the point where the stock has first arrived at the mill. The symbols used in the drawing are identified in the legend. Write approximately one page to explain how the system in the drawing works. You should write the explanation so that it can be understood by an OSHA official who needs to know what happens as the stock progresses through the plant's storage and delivery syste



DIRECTIONS: The figure below shows the cycle of a typical four-stroke spark-ignited gasoline engine. Write as much as you think is necessary to explain what happens during each stroke in the cycle. Assume you are writing for a person who has very little understanding of how a car engine works. If you think it is necessary, add labels, arrows, etc. to identify items, show movement, etc. in the figure.



Date: November 2, 1997

To: Paul Prins, Executive Director, Ferris Southwest (ATC)

From: Mark A. Curtis, Interim Dean M.C.

Subject: Concerns About Off Campus Advising, Procedures, Operations, Support And Laboratory Facilities At The ATC

Recently I met with the entire Manufacturing Engineering Technology faculty group to discuss several ongoing issues and other problems that precipitated personnel decisions earlier this semester. Before I begin to outline these issues and recommended solutions, please understand that the faculty and I are in total agreement.

Let's begin with the admissions procedure. Ferris has routinely given a favorable review of prior academic credit earned, including the associate degree or its equivalent. However, during any initial meeting with a prospective or admitted student, no promises relative to course substitutions or waivers should be made. All **waivers and course substitutions** must be made and approved following a thorough review of the situation by the program faculty (e.g., college credit earned, prior work experience, etc.).

Secondly, College of Technology programming at the ATC is offered in a known rotation. Students can and must follow this rotation in-so-far-as those courses with prerequisites. Routinely students have been admitted into courses for which they are only marginally qualified. Students who lack the appropriate prerequisite detract from the planned learning experience of others in a given course. Therefore, I will be asking the COT faculty to review programs delivered off-campus to confirm **prerequisites** which are to be enforced in the immediate future.

Thirdly, Ferris State University is a partner with Grand Rapids Community College at the ATC. We should be receiving the same laboratory/classroom access and level of support services. However, we are often not receiving the computer support necessary to run our technical programming effectively. The **computer labs** are not reliable, lack the needed software and are open an inadequate number of hours each week. What can be done?

Finally, your operation is not an 8:00 a.m. to 5:00 p.m. affair. For off-campus programming, the real workday begins at approximately 3:00 p.m. and runs up to 11:00 p.m. It would seem to make sense that your staff needs work what amounts to **2nd shift**. You're often surprised by the reluctance of my faculty to drive an hour each way to work nights, when your staff is not there to support them. Many of the problems we have encountered in advising, computer support, textbooks, and a thousand and one other difficulties could be minimized if you and your operation worked evenings. I look forward to discussing these issues with you.

cc Doug Chase, MFGE Faculty, & Dave Murray

COLLEGE OF TECHNOLOGY
1009 Campus Drive, Johnson 200, Big Rapids, MI 49307-2280
Phone 616 592-2890

PROPOSAL *** PROPOSAL *** PROPOSAL *** PROPOSAL *** PROPOSAL

MANUFACTURING ENGINEERING TECHNOLOGY
BACHELOR OF SCIENCE DEGREE - FOUR YEAR OPTION

FIRST YEAR - FALL SEMESTER

ETEC	140	Engineering Graphics	3
MFGE	111	MFGE Seminar	1
MFGE	113	Computer Apps. for Mfg. Engr.	3
MFGT	150	Manufacturing Processes	2
MATH	116	Inter. Algebra/Numerical Trig.	4
ENGL	150	English 1	3
			16 credits

FIRST YEAR - WINTER SEMESTER

MATL	240	Introduction to Material Science	4
MFGT	252	Advanced Machine Tools	2
BUSN	122	Introduction to Business	3
MATH	126	Algebra & Analytic Trig	4
____	___	SA/CE/GC elective	3
			16 credits

FIRST YEAR - SUMMER SEMESTER

MFGE	193	Internship	4

SECOND YEAR - FALL SEMESTER

MATL	341	Material Selection Metals	3
MECH	211	Fluid Mechanics	4
MECH	240	Statics & Strengths of Materials	3
MFGE	272	CNC & CAM	4
ENGL	211	Industrial & Career Writing	3
or			
ENGL	250	English 2	3
			17 credits

SECOND YEAR - WINTER SEMESTER

MECH	223	Thermo. & Heat Transfer	3
MECH	250	Fluid Power with Controls	2
PHYS	211	Introductory Physics 1	4
COMM	121	Fundamentals of Public Speaking	3
____	___	SA/CE/GC elective	3
			15 credits

THIRD YEAR - FALL SEMESTER

MFGE	311	Industrial Engineering	4
MFGE	341	Quality Science Statistics	3
____	___	Scientific Understanding elective	4
PSYC	150	Introduction to Psychology	3
____	___	SA/CE/GC elective	3
			17 credits

THIRD YEAR - WINTER SEMESTER

MFGE	321	Metrology	2
MFGE	322	Production Processes	3
MFGE	324	Tool Engineering	4
MFGE	342	Statistical Process Engineering	3
MATH	216	Applied Calculus 1	4
			16 credits

THIRD YEAR - SUMMER SEMESTER

MFGE	393	Internship	4

FOURTH YEAR - FALL SEMESTER

MFGE	411	Principles of Process Planning	4
MFGE	423	Engineering Economics	2
MFGE	442	Design of Experiments 1	3
EEET	419	Electrical Controls & Circuits	5
WELD	416	Welding Processes	2
			16 credits

FOURTH YEAR - WINTER SEMESTER

MFGE	421	Automation & Systems Design	3
MFGE	422	Manufacturing Facilities Planning	3
MFGE	499	Capstone Experience	1
PLTS	325	Plastics Processes	2
PSYC	326	Industrial-Organizational Psych	3
____	___	SA/CE/GC elective	3
			15 credits

TOTAL CREDITS = 128 coursework
+ 8 internship = 136

NOTE: All are existing courses taught in semesters indicated, except: a) MFGE 113, which is MFGE 313 redesignated, b) MFGE 111, which is similar to MECH 111, but tailored for MFGE students, and c) MFGE 193, which is similar to MFGE 393, but tailored for first-year students.

4YR-MFGE.WP6 (4/27/95)

3/6/98

PROPOSED COURSE LIST FOR
MASTER OF SCIENCE - ENGINEERING TECHNOLOGY
(MANUFACTURING ENGINEERING TECHNOLOGY OPTION)

A. Courses from College of Technology - DMGA Department (27 credits)

- Advanced Manufacturing Design Principles (3 credits)
  Project-oriented course detailing methods and techniques for designing/redesigning products for maximum productivity (Design for Manufacturability & Assembly/ Automation), selecting processes best suited to particular design features, evaluating life-cycle costs, Design for Maintainability, and Design for Recyclability.
- Ergonomics and Methods Analysis (3 credits)
  Project-oriented course dealing with workplace- and methods design to maximize productivity and minimize injuries.
- Advanced Quality Systems for Manufacturing (3 credits)
  ISO 9000, QS 9000, and similar standards, plus continuous improvement program development and implementation.
- Advanced Statistical Analysis (3 credits)
  Calculus-based advanced statistical analysis and experimental design methods.
- Manufacturing System Simulation (3 credits)
  Project-oriented course covering different levels and applications of computer simulation of manufacturing systems, including expert systems and neural networks.
- Advanced Manufacturing Process Planning and Project Management (3 credits)
  Project planning, including critical path analysis, and advanced process planning, including variant and generative process planning.
- Emerging Technologies (3 X 1 credit)
  Writing-intensive seminar courses featuring guest speakers from various industries reporting on latest trends in their areas of specialty, and/or thesis presentations.
- Thesis (6 credits or 2 X 3 credits)
  Identify a significant problem in a sponsoring company's manufacturing system, research solutions, solve the problem, and report in a professional manner. Note: all other course requirements must be met before the thesis is undertaken.

B. Courses from College of Business (6 credits)

- Two 3-credit courses (in different areas) from an approved list of finance, business law, marketing, sales, management, or other manufacturing-related courses

C. Course from College of Arts & Sciences (3 credits)

- One 3-credit course in research methods and technical report writing (suggested immediately prior to the thesis semester).

TOTAL - 36 CREDITS

PROPOSAL *** PROPOSAL *** PROPOSAL *** PROPOSAL *** PROPOSAL

MASTER OF SCIENCE - ENGINEERING TECHNOLOGY

COURSEWORK

Credits required - 36 (33 if internship can be waived)

New Courses Required - Manufacturing Engineering Technologies Department

Course	Proposed Title	Credits
ETEC 501	Advanced Computer Applications for Engineering Technology	3
ETEC 502	Advanced Studies in Welding Engineering Technology	3
ETEC 503	Advanced Studies in Quality Engineering Technology	3
ETEC 504	Design for Manufacturability and Assembly	3
ETEC 505	Advanced Studies in Plastics Engineering Technology	3
ETEC 506	Advanced Studies in Manufacturing Engineering Technology	3
ETEC 507	Simulation of Engineering Systems	3
ETEC 593	M.S.E.T. Internship	3
ETEC 595	M.S.E.T. Research	3
ETEC 599	M.S.E.T. Thesis	3

Existing Courses Required - College of Business (representative list - select 2)

Course	Title	Credits
STQM 341	Management Science	3
BLAW 301	Legal Environment of Business	3
MGMT 484	Contemporary Management Trends	3
ACCT 618	Issues in Financial Accounting	3
ACCT 628	Issues in Management Accounting	3

EXAMPLE SEQUENCES OF COURSEWORK

OPTION 1 - Full-time Students w/o internship waiver

YEAR 1			YEAR 2
Winter Semester	Summer Semester	Fall Semester	Winter Semester
ETEC 501	ETEC 593	ETEC 505	ETEC 599
ETEC 502		ETEC 506	
ETEC 503		ETEC 507	
ETEC 504		ETEC 595	
STQM 341		BLAW 301	

OPTION 2 - Part-time students w/ internship waiver

YEAR 1

Winter Semester	Summer Semester	Fall Semester
ETEC 501	STQM 341	ETEC 505
ETEC 502	BLAW 301	ETEC 506

YEAR 2

Winter Semester	Summer Semester	Fall Semester
ETEC 503	ETEC 595	ETEC 507
ETEC 504		ETEC 599

Manufacturing Engineering Technology
Quality Engineering Technology / Quality Certificate Series

FACULTY ACTIVITIES

Prepared by Gary Ovans

- Deliver two degree programs and certificate series with one faculty group
- Membership in professional societies
- Attend professional society meetings
- Attend national professional society exposition
- Attend student professional society meetings
- Faculty advisor to student professional society organizations
- Conduct program and COT tours
- Recruit at community colleges
- Write articles for regional and national technical publications
- Active laboratory management
- Specify and purchase laboratory equipment
- Specify and purchase laboratory consumable materials
- Obtain donations of consumable materials for laboratory work
- Obtain donations of equipment for laboratory work
- Obtain donations of software for laboratory and classroom work
- Student academic advising
- Perform student internship supervision
- Assist students in obtaining private professional scholarships
- Assist students with internship placement
- Assist students with full time placement
- Attend breakfast, lunch, dinner meetings with vendors, donors and employers
- Create/maintain program advertising
- Create/maintain annual reports
- Participate and arrange speakers for the COT technical symposium
- Arrange and take students on industry tours
- Participate in Autumn Adventure
- Participate in Homecoming
- Participate in summer student orientation program
- Attend industry sponsored training workshops
- Take undergraduate and graduate course work
- Perform industry consulting
- Participate on department committees
- Participate on COT committees
- Participate on University committees
- Deliver programs via Distance Learning
- Deliver courses/programs off-site at ATC
- Perform periodic curriculum review to maintain relevancy

GARY L. OVANS

15882 Belmont Drive
Big Rapids, MI 49307 **616/796-6582**

PROFESSIONAL OBJECTIVE:

To teach and contribute to academic leadership in the disciplines of Engineering Technology and Education.

EDUCATION:

Master of Science Degree in Occupational Education: November 1991. Highest distinction.

Bachelor of Science: Industrial Technology, 1976, University of Wisconsin-Stout, Menomonie, WI

Bachelor of Science: Sociology and Physics, 1975, University of Wisconsin-Eau Claire, Eau Claire, WI

Non-Degree Course Work:
Innumerable workshops and seminars, 1984 to present
Quality Science Certificate, Advanced Technical Studies 4 semesters,
12 Credits, May 1997, Ferris State University, Applied Technology Center
Groundwater and Distribution, Wastewater Management, Wastewater Lab & Disinfection, 1983, Waukesha County Technical Institute, Pewaukee, WI
Lifecycle Cost Analysis, 1981, North Central Technical Institute, Antigo, WI
Graphic Design, 1978, Milwaukee School of Engineering, Milwaukee, WI

U.S. Airforce Military Schools:
Airforce Supervisor/Management Training, 1972
Aircraft Loadmaster/Scanner, 1971
Electronic Monitoring and Analysis, 1964-65
Basic Survival, Arctic Survival, Water Survival courses, 1974-1976

INDUSTRIAL EXPERIENCE:

1985 to present:
Consulting, training seminars, and workshops
1976-1985:
Wauskesha Bearing Corporation, Manufacturing Engineer
Harley Davidson Motor Co., Process Engineer
FMC-Rolens Corp., Production Engineer
Chrysler Corp./Chrysler Marine, Process Engineer

Ferris State University and Community Service

Ferris State University – Program Coordinator, Manufacturing Engineering Technology, Quality Engineering Technology

Member: Academic Program Review Council of the Academic Senate
Member: Arts & Lecture Committee through 1997
Participant: Autumn Adventure, College of Technology
Member: Department Tenure Committee, formerly Chair
Coordinator: Society of Manufacturing Engineers, Student Chapter field trips
Proctor: SME Certified Technologist Examination

Community Service

Boy Scouts of America, Troop 114, Big rapids, Michigan. Assistant Scout Leader
4-H, Mecosta County, Adult Leader, Aerospace / Rocketry

Continuing Education – Workshops and Seminars Attended

1993 Stata Matrix ISO-9000 Lead Assessor workshop, Minneapolis, MN, one week
1995 Metrology Seminar, Burton Precision, Grand Rapids, MI, one day
1995 Material Handling Teachers Institute, Montana State University, Bozeman, MT, one week
1996 Summer Faculty Institute, Ferris State University, Big Rapids, MI
1997 Experimental Design Made easy, Stat-Ease, Inc., Minneapolis, MN, one week

Service to Industry – Workshops and Seminars Instructed

1993 ISO 9000 Executive Overview Seminar through Ferris State University, Technology Transfer Center
1994 Statistical Process Control Workshop, Fitzsimmons Manufacturing, through Ferris State University, Technology Transfer Center
1995 Statistical Process Control Workshop, Lobdell Emery Corporation, through Montcalm Community College
1996 Industrial Engineering Workshop, The Knoll Group Office Furniture Division, Grand Rapids, MI
Currently Conducting Quality Engineering Essentials and Manufacturing Engineering Essentials Seminars through the Society of Automotive Engineers and Grand Valley State University

MILITARY EXPERIENCE:

Completed 21 years of Active and Reserve Duty in the United States Airforce
World-Wide Service

Four years as an Electronic Intelligence Collector and Analyst

Seventeen years as a Combat Aircrewman on C-130 Hercules Aircrew

PROFESSIONAL:

Society of Manufacturing Engineers, Senior Member, Certified Manufacturing Engineer

HOBBIES:

Fishing, canoeing, scuba diving, reading, traveling, hunting, hiking, opera and theatre, gardening

Faculty Development / Service to Ferris & Community

David H. Anderson

Faculty Development

- 1997 Summer Institute for Faculty Development
- Introduction to Modern Ceramics 5 (C.E.U.) ASM International home study course
- New Analysis for Sheet Metal Forming - 3 day session - University of Wisconsin-Milwaukee
- Lead Assessor Certification Workshop - 1 week - Stat-A-Matrix Institute
- Long Distance Learning Training - Ferris State
- Member American Society for Material - West Michigan Chapter - Monthly technical meeting

Contributions to Ferris State

- Departmental Tenure Committee 1994 - 1996
- College Promotion Committee 1995 - 1977
  Chair 1996-1997
- Chairperson for Tenure Committee, William Winchell
- Committee member for Tenure Committee, Charles Drake
- Annual contribution to College of Technology Annual Picnic
- University Radiation Committee 1993 - 1994
- $650 donation to Manufacturing Engineering Technology local account from Nartron Corp. for steel coil testing
- $200 to Manufacturing Engineering Technology local account for $10.00/hour for 20 hours of delivery earnings to Fitzsimons hourly training
- Presented one-hour metallurgy training to AHM students per semester as requested by AHM faculty
- Donated $20,000 to Fremont Foundation to produce 2 - $500/year scholarships for Design, Manufacturing and Graphic Arts Department students - Scott D. Anderson Memorial Scholarship

Community Service

- Member Northland United Methodist Pastor Parish Committee 1993 - 1994
- Fairview Cemetery Association
  1996 - Present
- Mecosta County Genealogical Society Trustee 1997 - Present
- $10,000 to Fremont Foundation to provide 1 - $500/year scholarship for a Morley-Stanwood High School student that will be attending college classes

Faculty Development / Service to Ferris State University & Community

1993 to 1998

Peter Smania

Faculty Development

1993

- Technology Update Seminar (Sensors)
  8 hours on comparison of U.S. and European technology in the metal industry (including stamping, machining, welding and inspection) - February 19, 1993 at Applied Technology Center, Grand Rapids, MI

- Interactive TV Workshop
  2 days for 12 hours total on how to use interactive TV in preparation for the Metal Stamping Program - Ferris State University, Big Rapids, MI - June 1993

- Devcon Epoxies Model Making Demonstration
  3 hours at Ferris Machine Shop - May 14, 1996

- South Bend CNC Lathe School for our Machine
  5 days CNC programming and machine operation - November 9-13, 1993

- Metalform '93
  1 day, a sheet metal stamping exposition - Rosemont Convention Center - Rosemont, IL - March 16, 1993

1994

- IBM Computer Aided Design Training
  6 hours taught at Ferris State. Part 1, April 24, 1994 and Part 2, May 3, 1994

- International Machine Tool Show
  2 days at McCormick Place, Chicago, IL - September 14-15, 1994

1995

- Auto Computer Aided Design Training (AutoCAD)
  12 hours at Ferris - January 16, 17, 23, 1995

  I developed a screw machine course working for the Ferris Technology Transfer Center and a grant from the Michigan Jobs Commission. I was able to purchase and learn from a course of study from the National Screw Machine Association. This project has been a big help to me for 2 classes that I teach and it took a year to complete it.

1996

- International Machine Tool Show
  2 days at McCormick Place - September 5-6, 1996

1997

- Attended 4 one-hour seminars at the College of Technology Technical Symposium at Ferris State - 2/11/97
- Attended 6 hour seminar sponsored by Valenite at Ferris State. Topic was Insert Materials for Milling - 2/19/97

1998

- Attended 4 one-hour seminars at the College of Technology Technical Symposium at Ferris State - 2/18/98
- Attended a two-hour seminar sponsored by Citgo Oil Company at Ferris. One hour covered cutting fluids and one hour covered hydraulic oils - 2/23/98
- Attended a six-hour seminar sponsored by Valenite at Ferris State. The topic was Insert Materials for Turning and Drilling - 3/23/98
- I traveled to Toronto on a SME student-sponsored field trip related to industrial and educational visitations - 3/25 - 3/28/98
- I traveled to Amerikam in Grand Rapids and part of the day was devoted to company operation - 4/16/98 - approximately 3 hours

My students and I will be visiting 4 companies this semester in addition to the Amerikam visit mentioned above.

I have spent many hours learning Computer Aided Design and Machining as well as computer driven machines.

Ferris Committee Work

- I have served on the Sabbatical Leave Committee for ten years and Chairman for the last five. I also served on the All-University Sabbatical Leave Committee.
- In the summer of 1993, I completed one year of committee work serving on the All-University Academic Program Review Committee. We developed the guidelines currently used. I was chosen because the year before I had chaired the Automotive Machine Program Review Committee.
- I served on the Manufacturing Engineering Tenure Rules Committee in 1993 to establish new rules and procedures for tenure.
- I have been on the Newaygo County Career Technical Center Advisory Committee for the Machine Trades area for 14 years.

Service to Ferris State University

- I am starting my thirty-third year of teaching at Ferris State. I served sixteen years as an advisor for the Theta Alpha Sigma Student Service Fraternity of the College of Technology.

Community Service

- Member of St. Paul's Church in Big Rapids
- Donate to Boy Scouts, Troop 114 of Big Rapids
- On March 22, 1993 my wife and I appeared on Ferris State University's "International Connections" television program. The Program Coordinator, Penny Wheeler, heard about my teaching visit to China and requested that we share our experiences on television.
- I donate every year to the F.S.U. United Way campaign.
- I participated in the F.S.U. Muscular Dystrophy lock-up in February 1996. I was locked up for one hour at Rankin Center and had to get phone pledges to free me.

Contributions to Ferris State University

- <u>Extrude Home Corporation of Irwin, PA - March 8, 1993</u>
  A video tape request of a contact profilometer from Mr. William E. Miller, Sales Manager, led to a profilometer donation complete with accessories. Our metrology lab now as a state-of-the-art contact profilometer for student use. Many phone conversations were required before we received the gift. We also have the company logo displayed in the entrance hallway of the Manufacturing Tooling Technology lab. $5,280.00

- <u>Toyota Tooling Donation of Rockford, IL - January 1994</u>
  Ken Trimmer used to be a teacher in the defunct F.S.U. CNC Program. We have kept in contact even though he is not in Michigan anymore. I have asked him to look for tooling donations for the MFGT program. He visited us in January of 1994 and delivered a tooling donation of over $10,000 from Toyota.

- <u>Amerikam Company of Grand Rapids, MI - May 25, 1994</u>
  I made contact with Mr. Robert Creswell, owner of Amerikam and a past member of the FSU Board of Trustees. I requested any metal that he could donate to help the MFGT program. He responded with a donation of 10,233 lbs. of brass and steel. $12,744.84.

- <u>Valenite, Inc. of Troy, MI - 1990 to present</u>
  Once a year Mr. Doug Doney the Valenite Education Director presents a one-day tooling lecture to my students. This contact, besides the educational value for my students and I, has led to donations of tooling, computer software, training manuals, books and video tapes.

- Dave Anderson and I received a donation for EDM electrode graphite from Lake City Forge of Michigan. The value of the gift was $2,217. This was very useful to the MFGT program. 3/10/97.

- I made contact with a Bendix repairman who came to Big Rapids to do work for a local company. The result of this visit was to repair our Bendix profilometer at no charge. In addition, he donated $1,200 worth of accessories for our profilometer plus handouts and new knowledge on using profilometers.

Billy R. Thomas, Associate Professor
Manufacturing Engineering Technology

Education:

B.S. - Operations Management, University of Louisville
MBA - University of Louisville

Certifications:

Certified Manufacturing Engineer (C.Mfg.E) - Society of Manufacturing Engineers (SME)

Certified in Production and Inventory Management (CPIM) - American Production & Inventory Control Society (APICS)

Industry Experience:

Journeyman Tool & Die Maker - General Electric Co.
Industrial Engineer

Senior Process Engineer - Ford Motor Co.

Plant Engineering Manager - Federal Mogul Corp.

Manufacturing Engineering Manager - Wolverine Brass Works

Manufacturing Engineering Manager - American Seating Co.

Director of Engineering - Hart & Cooley Co.
Manager, Sales Engineering

Mark S. Rusco

16383 Warner Street
Grand Haven, MI 49417
(616) 846-9773 (H)

Education

May 1988

Central Michigan University
Mt. Pleasant, MI
Masters of Business Administration G.P.A. 3.6/4.0

March 1983

Michigan State University
East Lansing, MI
Bachelors of Science in Mechanical Engineering G.P.A. 3.2/4.0

June 1978

Grant Public High School
Grant, MI
University Preparatory Diploma

Work Experience

Ferris State University
Big Rapids, MI

January 1998 - Present

Assistant Professor -- I am a tenure track professor in the Manufacturing and Design Department. I teach classes with an emphasis on quality and manufacturing systems, such as Statistics, Continuous Improvement, Metrology, and others.

May 1997 - December 1997

Adjunct Faculty -- I have taught Management Science 341 -- Quantitative Analysis and MFGE-341 -- Quality Science Statistics.

GHSP
Grand Haven, MI

September 1992- January 1998

Quality Assurance Manager -- I was responsible for all quality throughout three separate facilities. I had four Quality Supervisors reporting to me for a total of 22 people in the Quality Department. I have written and implemented systems to satisfy GM's Targets for Excellence and most recently, for QS-9000. I was instrumental in writing a Project Management Procedure Manual, have implemented a Lot Traceability System to include all manufactured and purchased parts, and headed a three person team that successfully registered GHSP to the QS-9000 standard (ISO 9001). I have also been instrumental in implementing the Toyota Production System of Lean Manufacturing through my involvement with the manager's team. I edited the Lean Manufacturing Guidelines, a booklet of standards used at GHSP to implement Lean Manufacturing on the shop floor, developed a set of summary charts to track the implementation by workcenter, and have actively managed the implementation through the MBO process.

May 1990 - September 1992

Supplier Development Supervisor --- I supervised two Receiving Inspectors and two Supplier Development Facilitators. My responsibilities were to insure the quality of all purchased parts and services. I conducted supplier quality audits, helped suppliers with problem solving and implemented a supplier certification program.

October 1988- May 1990

Manufacturing Engineer -- I was responsible for upgrading the productivity of the equipment and the quality of the finished parts in the Stamping Department. I facilitated a quick die change program that reduced set-up time by an average of 50% on eight presses and installed a new die lubrication system that paid for itself in six months of oil savings alone.

Muskegon Community College
Muskegon, MI

May 1991 - April 1997

Adjunct Faculty -- I have presented various training seminars at company sites for the college.

September 1989 - May 1994

Holland Community Education
Holland, MI
SPC Instructor - I taught Statistical Process Control, level I and level II, each a 36-hour course.

October 1983 - June 1988

Hitachi Magnetics Company
Edmore, MI
Manufacturing Engineer -- I was responsible for all aspects of bringing a new magnetic material from Research and Development to full production. I trained employees, purchased new equipment, developed and documented processes, and solved manufacturing and quality issues. This product went from shipping samples to shipping $300K/Month within one year.

Manufacturing Engineer -- (Valparaiso, IN division) I was responsible for all aspects of manufacturing, maintenance, and quality at this small ferrite magnet plant. This company was a Ship-to-Stock supplier to GM and had a historical first-time yield of over 98%.

Michigan State University Custodial Department

September 1979 - December 1982

East Lansing, MI
Custodian - This was a 20 hour per week job to help pay school expenses.

Professional Memberships

April 1993 - Present	American Society for Quality Member
June 1994 - Present	American Society for Quality Board Member (currently Vice-Chair)
June 1993	American Society for Quality Certified Quality Engineer

Additional Training

SPC Level I and Level II (Instructor)

8-D Problem Solving (Instructor)

Quick Die Change (Instructor)

Push vs. Pull Manufacturing Simulation (Instructor)

ASQ CQE Refresher Course (Instructor)

Designed Experiments (Instructor)

Failure Mode and Effect Analysis (Instructor)

Dale Carnegie

References

References are available upon request.

VITA

Bruce Gregory
11179 15 Mile rd
Rodney, Michigan 49342
616/867-3345

Personal: Married
Three children
Birth date: 4/14/55

Education:

AAS degree; Ferris State College, Big Rapids, MI
1975; Major: Machine Tool

BS degree; Ferris State College, Big Rapids, MI
1978; Major: Manufacturing Engineering Technology

MS degree; The Rochester Institute of Technology; Rochester, NY
1993; Major: Applied and Mathematical Statistics

MS degree; Ferris State University, Big Rapids, MI
1997; Major: Occupational Education

Industrial and Related Experience:

9/75-5/76; Michigan Truck Plant; Wayne, Michigan
Line assembler; assembled Ford pickup trucks

6/78-6/82; Sealed Power Corporation; Muskegon, Michigan
Manufacturing Engineer; Developed new and optimized older manufacturing processes

8/82-6/83; Covenant High School; Unalakleet, Alaska
Volunteer Christian service; served a one year short term mission assignment along with my wife. Worked in maintenance, taught a small engines class, and substitute taught math on occasion

9/83-Present; Ferris State University; Big Rapids, Michigan
Associate Professor, Manufacturing Engineering Technology
Major Subjects taught include Statistical Quality Control, Design of Experiments, Principles of Process Planning, Tolerance Control, Engineering Economics

Services to Industry (5 year window)

- Design of Experiments-**Contech**, Alma, MI; Summer 1993
- Statistical Process Control - Fitzsimons, Big Rapids, MI; Fall 1994
- Design of Experiments - Fitzsimons, Big Rapids, MI; Fall 1994; Winter 1995
- Statistical Process Control - Lobdell Emery, Alma, MI; Spring 1995
- Statistics Review and Experiment Design - Fridgidaire, Greenville MI, Summer 1995
- Statistics Review and Experiment Design - Fridgidaire, Greenville MI, Winter 1996
- Assembly Tolerance Analysis seminar - Rexair, Inc., Cadillac, MI; summer 1996.
- Delivered "Quality Engineering Essentials" seminar along with two colleagues sponsored by the Society of Automotive Engineers (SAE); (fall 1996, winter 1997, fall 1997, winter 1998).
- Statistics Review and Experiment Design - Fridgidaire, Greenville MI, Summer 1995 and again summer 1996

Services to Industry (Continued)

- Delivered the seminar titled, "Manufacturing Engineering Essentials" along with two colleagues for Grand Valley State University (winter 1998)
- Developed and deliveried a customized Statistics/Design of Experiments course for Rexair, Inc., Cadillac, MI. (summer/fall 1998)
- Currently (1998-1999) developing basic SPC training course for Frigidaire, Greenville, MI

Services to University (5 year window)

- Tenure Policy Review Committee. Helped in streamlining and rewriting the department tenure policy; 1997-1998.
- Tenure Track Faculty Tenure Committees
  - Serve on Larry Langell's tenure committee. Larry is a new Plastics Faculty; (current)
  - Served on Larry Shult's tenure committee. Larry was granted tenure winter 1998.
  - Serve on Mark Rusco's tenure committee. Mark is our new manufacturing faculty
- Mentor; Assigned to be Mark Rusco's Mentor.
- ***Active*** Advisor to the student chapter of the Society of Manufacturing Engineers (SME); (current)
- Served on the planning committee for the first ever "Spaghetti Bridge Building Contest"; (fall 1997)
- Serving on curriculum review committee for manufacturing engineering technology program; (current)

Scholarly Activity

- Presented paper titled, "A Preliminary Summary of Research Regarding the Measurement of Instructional Delivery Improvement on College Campuses", Regional Conference American Society for Engineering (ASEE); April, 1996.
- Presented paper titled, "An Approach to Teaching Process Planning in Manufacturing Engineering Technology Curriculums", Regional Conference American Society for Engineering (ASEE); April, 1996.
- Presented paper entitled, "Integrating Course Work in Manufacturing Engineering Technology" , at the Annual Region Conference of the American Society for Engineering Educators (ASEE); April, 1998)

Services to Community

- Work with 3rd grade boys at Trinity Fellowship church as part of their Pioneer Club ministry. (current)

Workshops and Seminars Attended

- Programmable Logic controllers; Allen Bradley Corp. Sponsored by Grand Valley State University. Fall 1997.
- Response Surface Methods; StatEase Corporation. Minneapolis, MN. Summer 1997.

JAMES A. RUMPF

EDUCATION

June 1982	Bachelor of Mechanical Engineering, General Motors Institute (now Kettering University), Flint, MI. Thesis topic: "Computer-based Energy Management System Requirements for Fisher Body - Pittsburgh".
April 1988	Master of Science in Electrical Engineering, University of Pittsburgh, Pittsburgh, PA. Thesis topic: "An Assembler for the Texas Instruments TMS32010 Digital Signal Processor".
Additional	Ph.D. coursework in Industrial Engineering at Western Michigan University, Kalamazoo, MI.

EXPERIENCE

August 1990-present	Ferris State University, Manufacturing Engineering Technologies Dept. Swan Building Room 109, 915 Campus Drive, Big Rapids, MI 49307 Employed as an Associate Professor in the Manufacturing Engineering Technology program.
August 1987-April 1990	Society of Automotive Engineers, Inc. 400 Commonwealth Drive, Warrendale, PA 15096 Employed as a Staff Engineer-Land & Sea Technical Division.
May 1982-August 1987	General Motors Corp., Buick-Oldsmobile-Cadillac Group, Pittsburgh Manufacturing (formerly Fisher Body - Pittsburgh) PO Box 158, McKeesport, PA 15134. Employed as the Manufacturing Engineer-Automation.

PROFESSIONAL SOCIETIES	Society of Manufacturing Engineers, Senior Member and Faculty Advisor Society of Automotive Engineers, Full Member Institute of Industrial Engineers, Full Member

CONTRIBUTIONS TO FERRIS BEYOND TEACHING

University-wide activities

1991-92 & 1993-95	Academic Senate (Executive Board 1993-94)

1993-95	Distinguished Teacher Award Selection Committee
1995-98	Faculty Athletic Advisory Committee (Men's Basketball liaison 1995-97, Women's Tennis liaison 1997-98)
1994-present	Provide play-by-play coverage for Ferris sports events on Cable 7

<u>College-wide activities</u>

1997-present	Information Technology Advisory Group member (acting chair 1998)
1992-93	Program coordinator for metal stamping program

<u>Department and program activities</u>

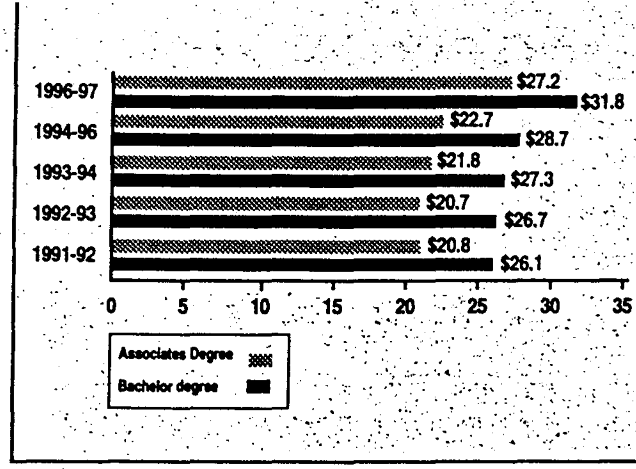
1991-92, 1994, 1997-98	MFGE Internship Coordinator
1992-95	CIM Committee
1997-present	Chair, Mark Rusco Tenure Committee

<u>Student activities</u>

1990-present	Assistant faculty advisor, SME Student Chapter

PROFESSIONAL SERVICES

1990-present	Consulting and seminar services to companies such as Frigidaire, Fiamm, Donnelly, SMS, Lacks Industries, IBM, Transmatic, Grand Haven Furniture Products, and Nicholas Plastics in such areas as motion & time study, process improvement, FMEA, and robotic and automation training.
1995-present	With program colleagues, have presented seminars through SAE and Grand Valley State University on various aspects of manufacturing- and quality engineering essentials.



Annual Salaries for DOCTORATE, MASTER, AND BACHELOR DEGREE GRADUATES For the Year 1996-97

College/Curriculum	Number Reporting Salary	Average Salary	Median Salary Range
ALLIED HEALTH			
Bachelors			
Health Care Systems Admin.	12	$28,833	$25,500 - 29,500
Health Information Management	8	27,000	20,000 - 23,000
Indus. & Envir Health Mgt.	8	25,500	24,000 - 27,000
Nursing, Professional	18	43,944	40,000 - 43,000
ARTS & SCIENCES			
Bachelors			
Applied Biology	4	31,500	24,000 - 27,000
Applied Math	4	26,500	25,500 - 29,500
Biotechnology	4	24,500	24,000 - 27,000
Social Work	13	20,885	20,000 - 23,000
BUSINESS			
Masters			
Information Systems Mgt.	8	50,000	48,000 - 51,000
elors			
ccountancy	13	25,192	24,000 - 27,000
Advertising	8	23,000	21,500 - 25,500
Business Administration	46	27,098	24,000 - 27,000
CIS/Accountancy	4	34,500	32,000 - 35,000
Computer Info Systems	13	27,462	28,000 - 31,000
Hospitality Management	8	24,000	20,000 - 23,000
Human Resource Management	5	27,900	24,000 - 27,000
Marketing	4	32,500	25,500 - 29,500
Marketing/Pro Golf Mgt	34	20,559	20,000 - 23,000
Marketing/Pro Tennis Mgt	5	29,500	20,000 - 23,000
Marketing/Sales	7	31,214	24,000 - 27,000
Public Relations	5	24,700	20,000 - 23,000
Small Business Management	5	29,500	28,000 - 31,000
Visual Communication	6	21,500	20,000 - 23,000

College/Curriculum	Number Reporting Salary	Average Salary	Median Salary Range
EDUCATION			
Masters			
Career and Technical Education	8	39,500	40,000 - 43,0
Bachelors			
Biology Education	4	26,500	25,500 - 29,5
Business Education	4	27,500	25,500 - 29,5
Criminal Justice	34	25,544	24,000 - 27,0
Recreation Leadership	4	25,500	24,000 - 27,0
Television Production	9	21,222	20,000 - 23,0
OPTOMETRY			
Doctorate			
O.D.	12	50,500	55,000 - 60,0
PHARMACY			
Bachelors			
Pharmacy	44	51,864	52,000 - 55,0
TECHNOLOGY			
Bachelors			
Auto & Heavy Equip Mgt.	29	33,086	32,000 - 35,0
Construction Management	24	33,667	32,000 - 35,0
Elec/Eltr Engr Tech	6	39,500	37,500 - 41,5
HVACR Engineering Tech	13	38,115	36,000 - 39,0
Manufacturing Engr Tech	11	45,500	44,000 - 47,0
~~Plastics Engr Tech~~	~~30~~	~~37,567~~	~~36,000 - 39,0~~
Printing Management	17	27,382	24,000 - 27,0
Product Design Engr Tech	9	33,500	32,000 - 35,0
Surveying Engineering	12	30,167	28,000 - 31,0
Welding Engineering Tech	15	41,233	40,000 - 43,0

Salary ranges not calculated for programs with less than four salaries reported.

Annual Salaries for ASSOCIATE DEGREE GRADUATES For the Year 1996-97

College/Curriculum	Number Reporting Salary	Average Salary	Median Salary Range
ALLIED HEALTH			
Dental Hygiene	20	$33,175	$32,000 - 35,000
Health Information Technology	9	19,889	20,000 - 23,000
Nursing Technology	9	30,833	28,000 - 31,000
Radiography (X-Ray)	14	23,893	24,000 - 27,000
Respiratory Care	4	24,500	24,000 - 27,000
ARTS & SCIENCES			
Industrial Chemistry Technology	6	26,167	24,000 - 27,000
BUSINESS			
	N/A	N/A	N/A

College/Curriculum	Number Reporting Salary	Average Salary	Median Salary Range
EDUCATION			
Child Development	4	13,625	10,000 - 12,0
OPTOMETRY			
	N/A	N/A	N/A
TECHNOLOGY			
Architectural Technology	8	19,688	17,500 - 21,5
Automotive Service	6	23,083	24,000 - 27,0
Building Construction Technology	5	35,900	32,000 - 35,0
Heavy Equipment Technology	10	29,900	25,500 - 29,5
HVACR Technology	5	30,300	32,000 - 35,0
Plastics Technology	7	37,500	40,000 - 43,0
Printing Technology	5	18,300	16,000 - 19,0

Salary ranges not calculated for programs with less than four salaries reported.

FERRIS STATE UNIVERSITY

Career Services
805 Campus Drive
Rankin Center - Room 206
Big Rapids, MI 49307

Phone 616-592-2685
Fax 616-592-2688
www.ferris.edu "other services"
University General Information 1-800-592-649

In the following section, each question is to be answered in two parts. For each activity listed, first place an "X" in the box which best indicates the relevance of the subject area to your work. In the shaded section, indicate whether the Manufacturing Engineering program should increase, decrease, or maintain the level of content of each activity in the program.

Activity	Highly Relevant	Relevant	Somewhat Relevant	Not Relevant	Increase	Keep Same	Decrease
Ability to evaluate work methods	7	7	1		5	10	
Ability to establish time standards	5	7	2	1	1	14	
Ability to estimate product costs related to manufacturing	9	3	2	1	9	6	
Ability to perform economic evaluation of project	8	5	2		7	8	
Application of statistical process control techniques	6	5	3	1	7	8	
Application of facilities planning techniques	2	9	3	1	4	10	1
Ability to perform statistically designed experiments	5	3	5	1	8	7	
Automation and systems design	5	5	2	2	5	10	
Process planning	9	3	3		7	6	2
Production and inventory control	1	4	7	3	4	9	2
Use of computer for manufacturing applications	7	5	1	2	8	7	
Understand production machining processes	5	6	3	2	5	10	
Understand production plastics processes	5	4	2	4	5	10	
Understand production welding processes	4	7	3	1	3	12	
Understand production pressworking processes	5	4	4	2	4	10	
Proper use and implementation of measurement systems	8	2	4	1	9	6	
Technical reports and presentations	5	6	3	1	6	9	
Understanding concepts of tool engineering	3	7	1	3	2	13	
Cutting tools and machinability	6	3	3	3	4	9	2
High performance tool materials	4	4	5	2	6	8	1
Jig, fixture design, and work holding	5	6	2	2	5	9	1
Special tooling and tooling applications	5	5	3	2	4	10	1
Technical electives							
CAD/CAM	5	7	2	1	2	12	1
Electronics	3	8	1	3	3	11	1
Metallurgy - material science	5	5	4	1	5	10	
Communication skills	9	4	2		8	7	
Required math level	7	6	1	1	5	9	1
Other elements of your educational experience							
Internship	10	4	1	1	5	10	
Plant visits	7	5	1	2	8	6	
Guest speakers		1				1	
Facilities to support lab activities	8	5	1	1	8	7	

Current Work Experience

List three job functions related to your current position:

1. Tool/Equip purchasing; cost estimating; CNC programming; process planning; process deveopment; Project manager; CAD, detail drafting; process definition; packaging; computer skills; machine design; cost reductions, oursource tools; estimate product costs; layouts on CAD 2. Fixture/Tool design; concept deesign; process control; tooling & applications; capital equipment justification; mfg. eng.; organization; capacity control; secondary equip. outsourcing; drafting standards; project planning; customer interaction; project management; time studied standards 3. Machine repair/rebuild; time lines; machine tools set-up and run; fixture design ; quoting new jobs ; die design; project design; standard development; welding processes; manuracturing processing; process documentation; cost analysis; continuous improvement

If you have any further comments, please turn this page over →

Alumni Survey 1998
Manufacturing Engineering Technology Comments
As of 7/21/98

1. You guys did a good job, but more for tool makers, less production.

2. Even more hands on with machinery and processing would be valuable.

3. I would have trouble recommending FSU to anyone, not based on program, but based on: Big Rapids city fathers poor support of students and poor faculty – FSU administration relations. Is our school shrinking? Others must feel the same.

4. I recommend that Ferris make appropriate changes to the curriculum and the curriculum title to label it "Mfg. Engineering". The "Technology" portion of the present title causes less than favorable questions relative to whether or not a tech student can handle Mfg. Eng. Positions. You're looked upon as a technologist rather than full engineer and the salaries are affected.

5. In my current job I have been involved in 3 machine rebuilds/retrofits. Skills and information relevant to these projects I had to learn on my own or from other coworkers. There may be a need for classes about this subject at FSU. My skills in the areas of electrical/electronics was proficient however I lacked in knowledge when it came to hydraulics and basic machine geometry and prove-out. A general course on machine repair/retrofitting may be a great asset to the student coming out of the program.

Manufacturing Engineering Technology
B.S. Program

Industry Survey

Company Name:
Company Address:
Type of Business:
Contact Person: **Phone / FAX Numbers:**
1. How many Ferris graduates do you employ?
2. What percentage have the skills you require? (rough estimate)
3. What improvements are needed in the preparation (undergraduate education) of that group?
4. Would you consider hiring a Ferris graduate again in the future?

Thank you.

Please return by August 25, 1998 to:
Manufacturing Engineering Technology
Ferris State University
915 Campus Drive, Swan 109
Big Rapids, MI 49307

Program Self-Study for Academic Program Review
Survey of Third-Year Students
Winter 1998

Program Enrolled_______________________________Age_________ Sex M F

Big Rapids Campus ☐

Grand Rapids ATC ☐

Metal Stamping ☐

High School_________________________________ Location_______________________

Year Graduated______________________

Transfer Student _____yes ______no If so, where from?______________________

1. Who/what helped you decide to come to Ferris State University? (check all that apply)

____Counselor ____Parents ____Other relatives

____Teacher ____Friends ____Co-workers on job

____Advertisements ____Others (explain)______________________________

2. Who/what helped you decide to enroll in the MFGE program? (check all that apply)

____Counselor ____Parents ____Other relatives

____Teacher ____Friends ____Co-workers on job

____Advertisements ____Others (explain)______________________________

3. Your impression of the Application/Admissions/Financial Aid/Registration Process:

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

4. Your impression of the Manufacturing Engineering Technology program faculty:

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

5. What is your impression of the laboratory facilities and equipment for your courses:

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

6. What is your impression of the Manufacturing Engineering Technology program course of study?

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

7. What are your plans after completing your B.S. Manufacturing Engineering Technology degree?

____Go to work

____Go to work and attend school part-time

____Stay in school and enter a M.S. degree program

____Enroll in another B.S. program at Ferris State University

____Transfer to another university (If so, where:______________________)

____Undecided

Program Self-Study for Academic Program Review
Survey of Fourth-Year Students
Winter 1998

Program Enrolled____

Big Rapids Campus ☐

Grand Rapids ATC ☐

Metal Stamping ☐

High School_______________________________ Location______________________

Year Graduated______________________

Transfer Student _____yes ______no If so, where from?____________________

8. Who/what helped you decide to come to Ferris State University? (check all that apply)

____Counselor ____Parents ____Other relatives

____Teacher ____Friends ____Co-workers on job

____Advertisements ____Others (explain)______________________________

9. Who/what helped you decide to enroll in the MFGE program? (check all that apply)

____Counselor ____Parents ____Other relatives

____Teacher ____Friends ____Co-workers on job

____Advertisements ____Others (explain)______________________________

10. Your impression of the Application/Admissions/Financial Aid/Registration Process:

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

11. Your impression of the Manufacturing Engineering Technology program faculty:

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

12. What is your impression of the laboratory facilities and equipment for your courses:

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

13. What is your impression of the Manufacturing Engineering Technology program course of study?

____Very favorable ____Favorable ____Neutral

____Unfavorable ____Very Unfavorable

Comments____

____

____

14. What are your plans after completing your B.S. Manufacturing Engineering Technology degree?

____Go to work

____Go to work and attend school part-time

____Stay in school and enter a M.S. degree program

____Enroll in another B.S. program at Ferris State University

____Transfer to another university (If so, where:______________________)

____Undecided

Faculty Perceptions of the Manufacturing Engineering Technology Program

PROGRAM AREA:______________________________

	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5	Unknown U
1. The FSU MFGE program is consistent with the FSU Mission Statement						
2. The FSU MFGE program is consistent with the objectives and goals of the FSU College of Technology						
3. The FSU MFGE faculty support the MFGE program.						
4. FSU administration supports the FSU MFGE program.						
5. The cost of administering the FSU MFGE program is inexpensive compared to other FSU technology baccalaureate programs						
6. The MFGE current equipment is sufficient to support a high quality program.						
7. The present facilities assigned to the MFGE program are sufficient to support a high quality program.						
8. The currently enrolled MFGE students rate instructional effectiveness as high.						
9. The currently enrolled MFGE students are very satisfied with the program, faculty, equipment & curriculum.						

	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5	Unknown U
10. The graduates of the MFGE program easily find employment in their chosen field.						
11. The starting salary of the MFGE program's graduates is comparable to other College of Technology B.S. degrees.						
12. The employers of MFGE graduates rate the quality of the program graduate's performance as high when compared to similar degrees from other institutions.						
13. The students in the AAS programs that ladder into the +2 MFGE B.S. degree rate the MFGE program as a high quality option.						
14. The number of tracks or options in the MFGE program should be increased whenever possible.						
15. The academic reputation of the MFGE courses counting towards COT degrees is sound.						
16. The academic reputation of the MATL courses counting towards COT degrees is sound.						
17. The FSU MFGE B.S. is a quality degree comparable to other baccalaureate degrees in similar institutions.						
18.The equipment and facilities are adequate to provide highest quality supporting classes to related technology students who enroll in MFGE courses required for their major.						

	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5	Unknown U
19.The equipment and facilities are adequate to provide highest quality supporting classes to related technology students who enroll in MATL courses required for their major.						
20. The MFGE program needs to expand the options available to recruit potential students to maintain enrollment and satisfy employer demand for graduates						
21. MFGE Faculty Development is supported financially by the FSU administration.						

Faculty Comments:

Perceptions of the Manufacturing Engineering Technology Program by Faculty of AAS Programs that Ladder into the +2 MFGE Degree

PROGRAM AREA:______________________________________

	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5	Unknown U
1. The FSU MFGE Program is consistent with the FSU Mission Statement.						
2. The FSU MFGE program is consistent with the objectives and goals of the FSU College of Technology.						
3. FSU administration supports the FSU MFGE program.						
4. The cost of administering the FSU MFGE program is inexpensive compared to other FSU technology baccalaureate programs.						
5. The MFGE current equipment is sufficient to support a high quality program.						
6. The present facilities assigned to the MFGE program are sufficient to support a high quality program.						
7. The +2 MFGE degree is a quality degree that adds significant value to your AAS degree graduates.						
8. The +2 MFGE degree is comparable to other BS options for your AAS degree graduates.						
9. Students from your AAS degree can easily articulate to the +2 MFGE BS degree.						
10. The curriculum content of the +2 MFGE degree correlates with the expectations of your Advisory Board for additional coursework beyond your AAS degree.						

Please use reverse side for comments. Thank you.

Faculty Perceptions of the Manufacturing Engineering Technology and Material Science Technical Support Classes Provided by the Manufacturing Engineering Technology Program for Their Program

PROGRAM AREA:____________________

	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5	Unknown U
1. The instructional facilities and equipment of the MFGE coursework meet your program objectives and student needs.						
2. The instructional facilities and equipment of the MATL coursework meet your program objectives and student needs.						
3. Applicable supportive courses are closely coordinated with your program and are kept relevant to your program goals and current to the needs of students.						
4. Currently enrolled students in your program rate the MFGE instructional effectiveness as extremely high.						
5. Currently enrolled students in your program rate the MATL instructional effectiveness as extremely high.						
6. The curriculum content of the supportive classes meet or exceed the expectations of your program.						
7. The time of delivery and number of sections available are adequate to meet your students' needs.						

Faculty Comments:

Manufacturing Engineering Technology Advisory Board

Ken Assink
JR Automation Technologies Incorporated
13365 Tyler Street
Holland, MI 49424
Phone: 616 399 2168
FAX: 616 399 5593

James Courtright
Production Engineering Manager
Brunswick Bowling
575 West Laketon Ave.
PO Box 329
Muskegon, MI 49443
Phone: 616 725 3300
FAX: 616 725 4735

Robert Creswell
Chairman
Amerikam
1337 Judd Avenue SW
Grand Rapids, MI 49509
Phone: 616 243 5833
FAX:

Ron Harrelson
Operations Manager
Caterpillar Training Institute
826 W. Progress
Metamora, IL 61548
Phone: 309 675 1568
FAX: 309 675 6584

Mark Herman
Manufacturing Engineering
Acutex Division
SPX Corporation
2001 Peach Street
Whitehall, MI 49461
Phone: 616 894 3200, Ext. 3299
FAX: 616 894 3255

Lloyd Esterline`
Group Manager
NAO Process Engineering
Diesel Technology
4300 44th St. SE
Kentwood, MI 49512
Phone: 616 554 6624
FAX: 616 554 6968

Mike Nickels
UAW Training Coordinator
Grand Rapids Metal Stamping Plant
General Motors (CPC)
300 36th Street SW
Grand Rapids, MI 49548-2107
Phone: 616 246 3196
FAX:

William Rollins
Director
Fixture Machines
Steelcase North America
Mail Code: FM PO Box 1967
Grand Rapids, MI 49501-1967
Phone: 616 698 5510
FAX: 616 246 4216

Paul Smith
Vice President
Marketing
Olofsson Corporation
PO Box 27308
2727 Lyons Avenue
Lansing, MI 48909
Phone: 517 393 4700
FAX: 517 887 1160

Mark Stratton
Manager
Manufacturing Engineering Education
Society of Manufacturing Engineers
One SME Drive
PO Box 930
Dearborn, MI 48121
Phone: 313 271 1500
FAX:

William Todd
Director
Advanced Process Engineering
Simpson Industries
47603 Halyard Drive
Plymouth, MI 48170
Phone:
FAX:

Scott Hilty
Manufacturing Engineer
United Erectors
9220 Belding Road
Rockford, MI 49341
Phone: 616 874 7255
FAX: 616 874 7166

Criteria for Accrediting Programs in Engineering Technology

For Programs Evaluated During

the 1998-99 Accreditation Cycle

(Incorporates all changes approved by the ABET Board of Directors as of November 1, 1997.)

I. INTRODUCTION

I.A. Purposes

The purposes of the Accreditation Board for Engineering and Technology (hereafter referred to as ABET) as related to accreditation are stated in the Constitution as follows:

I.A.1. Organize and carry out a comprehensive program of accreditation of pertinent curricula leading to degrees, and assist academic institutions in planning their educational programs.

I.A.2. Promote the intellectual development of those interested in engineering and engineering-related professions, and provide technical assistance to agencies having engineering-related regulatory authority applicable to accreditation.

I.B. Responsibilities

I.B.1. ABET accomplishes its purposes through standing committees or commissions, one of which is the Technology Accreditation Commission (hereafter referred to as TAC or TAC of ABET). The accreditation commissions are charged with the following responsibilities.

I.B.1.a. The accreditation commissions shall propose policies, procedures, and criteria to the ABET Board of Directors for approval. The Board of Directors shall review policies, procedures, and accreditation criteria and may specify changes to be made in them to the appropriate accreditation commissions.

I.B.1.b. The accreditation commissions shall administer the accreditation process based on policies, procedures, and criteria approved in advance by the Board of Directors. The accreditation commissions shall make final decisions, except for appeals, on accreditation actions.

I.B.2. Procedures and decisions on all appeals to accreditation actions shall be the responsibility of the Board of Directors.

I.C. Objectives of Accreditation

The purposes stated above are basic to accreditation efforts in engineering technology education. Accreditation seeks to attain the following specific objectives:

I.C.1. To serve the public, industry, and the engineering profession generally by stimulating the development of improved engineering technology education.

I.C.2. To identify for prospective students, student counselors, parents, potential employers, public bodies, and officials, engineering technology programs which meet the minimum ABET criteria in engineering technology.

I.C.3. To provide stimulation leading to curricular improvement in existing programs and to assist in the development of educational models for establishing new engineering technology programs as increased service to the public interest.

I.D. Development

ABET is recognized by the U.S. Department of Education as the sole agency responsible for accreditation of educational programs leading to associate and baccalaureate degrees in engineering technology. In 1944 the Engineers' Council for Professional Development (now ABET) appointed a Subcommittee on Technical Institutes. On October 5, 1964, this subcommittee became a standing committee of ECPD and established a basis for accrediting programs of the technical institute type, now designated as programs in engineering technology. Amendments and additions have from time to time been adopted. The original statement and its amendments and additions are combined here into a unified statement of the policies, methods of evaluation, criteria, and procedures which pertain to the accreditation of engineering technology programs.

I.E. Description of Programs

I.E.1. Programs to be considered are technological in nature and are in the field of higher education. Instruction is in the broad area of technical education between engineering and vocational education/industrial technology.

I.E.2. The definitions that follow clarify terms used by TAC of ABET.

I.E.2.a. Engineering technology is a part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer. The term "engineering technician" is applied to the graduates of associate degree programs. Graduates of baccalaureate programs are called "engineering technologists."

I.E.2.b. An engineering technology program is a planned sequence of college-level courses designed to prepare students to work in the field of engineering technology. The term "college-level" indicates the rigor and degree of achievement required.

I.E.3. Briefly, the differences between educational programs in engineering technology and industrial technology include type of faculty, use of facilities, mathematics and science sequence content, and degree of specialization. More faculty members with professional educational backgrounds appear to staff the present industrial technology programs, whereas a larger number with engineering or technological backgrounds staff the engineering technology programs.

II. POLICIES

II.A. Accreditation Policies

Accreditation of programs in engineering technology is accomplished under the following general policies.

II.A.1. TAC of ABET will consider for accreditation programs offered in an institution of higher learning in one of the following categories:

II.A.1.a. Institutions currently accredited by a regional or national institutional accrediting agency or formally approved by a State authority recognized by the U.S. Department of Education.

II.A.1.b. Institutions holding appropriate approval by a State authority to offer only engineering, engineering technology, or engineering-related programs, of a combination thereof, and not offering programs in any other field or discipline; or other institutions offering programs in engineering technology whose accreditation would further the objectives of ABET.

II.A.2. Programs are considered for accreditation action only at the written request of the institution.

II.A.3. Only individual programs are accredited, rather than institutions, for it is recognized that programs of different standards and objectives may be found at the same institution. When a multi-campus institution presents programs for accreditation, each campus will be considered as a separate institution in the evaluation process. In order for a program to be accredited, all routes to completion of the program must be accreditable.

II.A.3.a. Options, Alternative curricula within a major engineering technology program (commonly called options) leading to a degree in a subfield of the major discipline may be accredited and listed as separate programs at the request of the institution. In such case the option must have been formally designated by the institution prior to the request for evaluation. It must conform to the criteria and to any program criteria applicable to independent programs in the same curricular area as the option. The accreditation status of the option must be clearly identified and distinguished from any non-accredited options within the same major program, and from any other programs.

II.A.3.b. Evening and Off-Campus Programs – Evening and off-campus programs may be accredited as integral with the regular on-campus day program, if they follow the same curriculum, use the same or equivalent laboratory facilities and equipment, and are subject to the same supervision and control of academic standards. The institution must demonstrate that evening and off-campus programs are conducted to the same standards of subject matter coverage and rigor of student work and grading.

II.A.4. As used in these criteria, the word *must* indicates definite obligatory requirements that TAC expects as a minimum to be met for a program to be accreditable by TAC of ABET. The word *should* indicates more permissive recommendations that may have an effect on accreditation.

II.A.5. Accreditation by TAC of ABET is based on meeting differential criteria applicable to programs which lead to the associate degree or to the baccalaureate degree.

II.A.6. An evaluation visit for accreditation will be carried out only if students have been graduated from the program prior to the on-site visit. If granted, such accreditation will extend to the graduates of the program of the previous year.

II.A.7. Qualitative factors, as well as quantitative factors, are given careful consideration through a visit by an evaluation team of competent personnel appropriately constituted for the curriculum under consideration.

II.A.8. Although rigid quantitative standards are not considered sacrosanct, programs are expected to meet the minimum standards delineated in the criteria. Well-planned experimentation and development in engineering technology education are encouraged. Experimental or nontraditional programs will be evaluated against the intent of the minimums established.

II.A.9. Such matters of broad institutional function as administration, student personnel services, library, arts and sciences, etc., are considered only with respect to services rendered to engineering technology and are reviewed with different emphasis within institutions with regional accreditation versus those without such accreditation. When an institution not holding regional accreditation is visited, these areas are examined in depth within ABET policy.

II.A.10. Accreditation is denied to programs which omit instruction in a significant portion of a subject in which technicians and/or technologists in a particular field may reasonably be expected to have competence. This policy is intended to be a safeguard to the public and should not entail the setting of rigid standards.

II.A.11. The institution presents complete data pertinent to a comprehensive evaluation. Information supplied by the institution is for the confidential use of ABET and will not be disclosed without the written authorization of the chief administrative officer of the institution or his/her designee.

II.A.12.

II.A.12.a. Caution and discretion must be exercised by institutions in all publications and references to avoid ambiguity or confusion among engineering technology, engineering and engineering-related specialties. TAC of ABET will not accredit a program in engineering technology if the institution makes the claim that the program is intended to give its graduates the equivalent of an engineering education as defined by ABET, or improperly uses the term "engineer" or "engineering" in any of its official publications. Where confusion exists, the institution must take positive steps in its publications and other media to help the public distinguish between engineering technology and engineering programs.

II.A.12.b. Although the selection of program titles is the prerogative of educational institutions, ABET discourages the proliferation of engineering technology program titles, because different titles for essentially the same program are confusing or misleading to the public, including students, prospective students, and employers. Preferred curriculum titles for accredited programs would include the words "engineering technology." No program will be approved for accreditation or reaccreditation unless the word "technology" is used as the final noun in the title.

II.A.12.c. For accreditation to be granted, a program must have a title that is consistent with the curriculum content, and the content must satisfy the ABET criteria and Participating Body program criteria applicable in accordance with section VI. as appropriate to that content.

II.A.13. A draft visitation report is submitted to the dean or appropriate academic administrator of the institution for comment on the factual elements of the report before accreditation action is taken.

II.A.14. The findings and recommendations of the visiting team are submitted for review by the appropriate officers of TAC of ABET and then by the full membership of the commission. The final decision on accreditation rests with TAC of ABET, except in cases of appeal of not-to-accredit actions, which are the responsibility of the ABET Board of Directors.

II.A.15. A list of currently accredited programs is published annually. The accredited status of a program listed in the *ABET Accreditation Yearbook* applies to all graduates who completed the program during the academic year indicated therein.

II.B. Revocation of Accreditation

Questions regarding the continued compliance of such programs during the period of accreditation may be directed to ABET. If it appears that an accredited program is not in compliance with ABET criteria, the institution is so notified. If the response from the institution is not adequate, ABET may institute revocation for cause procedures. The institution is notified of the reasons why revocation is to be instituted. An on-site visit is scheduled to determine the facts. A comprehensive document showing the reasons for revocation is provided to the institution for its analysis and its response. If the institution's response is not adequate, revocation for cause is implemented. The institution is promptly notified by the president of ABET of such action together with a supporting statement showing cause. A revocation constitutes a "not-to-accredit" action and is appealable. Accreditation is continued until the appeal procedure has terminated.

II.C. Appeal Policy and Procedure

II.C.1. An institution, upon receipt of the final action of "not-to-accredit", may request:

II.C.1.a. An immediate revisit,

II.C.1.b. A Reconsideration of the final action, or

II.C.1.c. An immediate appeal of the final action to the Board of Directors.

II.D. Public Release Policy

II.D.1. Accreditation by TAC of ABET is based on satisfying minimum educational criteria. As a measure of quality, it assures only that an accredited program satisfies the minimum standards. The various periods or terms of accreditation do not represent a relative ranking of programs in terms of quality. At no point is an institution allowed to publish or imply the term or period of accreditation. Public announcement of the accreditation action should only relate to the attainment of accredited status. Because accreditation is specific to a program, all statements on accreditation status must refer only to those programs that are accredited. No implication should be made by an announcement or release that accreditation by TAC of ABET applies to any programs other than the accredited ones.

II.D.2. College catalogs and similar publications must clearly indicate the programs accredited by TAC of ABET as separate and distinct from any other programs or kinds of accreditation. No implication should be made in any listing that all programs are accredited because of an institution's regional or institutional accreditation. Accredited engineering technology programs should be specifically identified as "accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202, Telephone: (410) 347-7700."

II.D.3. Direct quotation in whole or in part from any statement by TAC of ABET to the institution is unauthorized. Correspondence and reports between the accrediting agency and the institution are confidential documents and should only be released to authorized personnel at the institution. Any document so released must clearly state that it is confidential. Wherever institution policy or state or federal laws require the release of any confidential documents, the entire document must be released.

II.D.4. If accreditation is withdrawn or discontinued, the institution will no longer refer to the program as being accredited.

III. METHOD OF EVALUATION

III.A. Questionnaire

One of the first steps in the accreditation process for a program is the submission by the institution of information and data in the form of a self-study questionnaire and its review by TAC of ABET prior to an on-site visit. The self-study questionnaire must include day and evening programs and all incorporated options and off-campus offerings.

III.B. On-site Visit

The on-site visit team will examine all incorporated day, evening, option and off-campus offerings.

III.B.1. The questionnaire will be supplemented by a report of an on-site visit by a carefully selected team drawn from the official engineering technology list of program evaluators. The purpose of the on-site visit is three-fold.

III.B.1.a. The visiting team will assess factors that cannot be adequately described in the questionnaire. The intellectual atmosphere, the morale of the faculty and the students, the caliber of the staff and student body, and the character of the work performed are examples of intangible qualitative factors that are difficult to describe in a written statement.

III.B.1.b. The visiting team will help the institution assess its weak points as well as its strong points.

III.B.1.c. The team will examine in further detail material compiled by the institution relating to but not limited to the following:

III.B.1.c.1. Auspices, control, and organization of the institution and of the engineering technology division.

III.B.1.c.2. Educational programs offered and degrees conferred.

III.B.1.c.3. Maturity and stability of the institution and of the individual educational programs.

III.B.1.c.4. Basis of and requirements for admission of students.

III.B.1.c.5. Number of students enrolled:

III.B.1.c.5.A. in the technology college or division as a whole, and

III.B.1.c.5.B. in the individual educational programs.

III.B.1.c.6. Teaching staff, teaching loads, and faculty salaries.

III.B.1.c.7. Physical facilities, adequacy of the educational plant devoted to engineering technology education.

III.B.1.c.8. Finances, investments, expenditures, sources of income.

III.B.1.c.9. Curricular content of the program and items of student course work. In order to make a qualitative evaluation of a program, it is necessary that the institution exhibit teaching materials such as course outlines and textbooks for all courses required for graduation. Sufficient examples of student work in technical, mathematics, and science courses must be available to the visiting team for the entire campus visit. The examples should show a range of grades for assignments, including homework, quizzes, examinations, drawings, laboratory reports, projects, and samples of computer usage in technical courses. Examples must also be presented to demonstrate compliance with the requirement for student competence in written and oral communications as specified in section V.C.5.a.

III.B.1.c.10. Provisions for keeping the program current.

III.B.2. Additional evaluation activities by the on-site visiting team include the following.

III.B.2.a. The team will review records of the employment of graduates to evaluate placement and performance in terms of goals stated for each program.

III.B.2.b. The team's factual findings are presented orally to the institution's chief executive officer or designee and such faculty personnel as he or she wishes to assemble. The opportunity is presented at this time for the correction of factual errors in the team's observations.

III.C. Review

Following these activities, the report of the on-site visiting team and the institution's response are reviewed by TAC of ABET prior to taking final accreditation action.

IV. PROCEDURE

IV.A. Application and Preparation for Visit

IV.A.1. Consideration of engineering technology programs for accreditation is done at the invitation of the institution. TAC of ABET is prepared to examine associate and baccalaureate programs that appear likely to satisfy the respective criteria. Programs offered by institutions in the United States are eligible for review.

IV.A.2. An institution desiring the accreditation of any or all of its programs leading to degrees in engineering technology may communicate directly with ABET headquarters. This will activate established arrangements for TAC of ABET to secure advance information by questionnaire, and to conduct an evaluation by a team constituted for that particular visit.

IV.B. Visit and Report

IV.B.1. Each visiting team is selected, on the basis of the programs to be considered, from lists provided by the professional societies. The visiting team reports its preliminary findings and recommendations in writing to the officers of TAC of ABET for editing and transmission to the institution visited.

IV.B.2. Between the time of the visit and the annual meeting of TAC of ABET, the responsible administrative officer of the institution may submit to the commission any supplemental information which he or she believes may be useful to the commission in its consideration and appraisal of the visiting team's report. The institution may submit additional information to the team chair that must be received at least two weeks prior to the annual decision making meeting. Any material to be considered by the commission must be in writing to be valid in a subsequent appeal. The operating policy of TAC of ABET has been to base its accreditation actions on the status of the respective program at the time of the on-site visit. However, the commission has maintained a flexible attitude toward the addition or modification of discrete items, based on conditions altered after the team visit but prior to the commission's accreditation deliberations. Weaknesses existing at the time of the visit are considered to have been corrected only when the correction or revision has been made effective, is substantiated by official documents signed by the responsible administrative officers, or other evidence required by TAC of ABET is provided. Where action to correct a problem has been initiated but not completed to the satisfaction of TAC of ABET, or where only indications of good intent are given, the action will not be considered in current accreditation deliberations.

IV.C. Accreditation Action

IV.C.1. Final decision on accreditation rests with TAC of ABET, which acts on the recommendations made to it by the visiting team and on consideration of the institution's response to the preliminary report of findings or, in the case of actions based on progress reports, on the institution's report.

IV.C.2. Accreditation of a program is granted for a limited period, not to exceed six years, with reappraisal stipulated at the end of this period. The term of accreditation is subject to review for cause at any time during the period of accreditation. Accreditation is granted only when conditions are considered to meet minimum criteria.

IV.C.3. A "not-to-reaccredit" action under "show cause" is effective as of the beginning of the academic year closest to September 30 of the calendar year following the year of the "not-to-reaccredit" decision by an accreditation commission or by the Board of Directors in appeal cases. The notification to the institution shall indicate (a) that the termination supersedes the accredited status listing of the program in the current *ABET Accreditation Yearbook* and (b) that ABET expects the institution to formally notify students and faculty affected by the termination of the program's accredited status, not later than September 30 of the calendar year of the "not-to-reaccredit" action.

IV.C.4. When reaccreditation of a program has been denied by the TAC and not reversed by the ABET Board of Directors on appeal, or when a program is being discontinued by the educational institution within the period for which accreditation has been granted, ABET will include a note in its next annual listing of accredited programs indicating the expected date for discontinuation of the program or expiration of accreditation. Accreditation of a program in the process of being discontinued may be extended on a year-by-year basis subject to acceptance by the TAC of a satisfactory continuation report by the institution.

IV.C.5. A comprehensive evaluation of the total engineering technology activity under TAC of ABET purview at an institution, including all engineering technology programs and the related supporting offerings, will be conducted at intervals not exceeding six years. Interim accreditation of individual programs may be requested by an institution at a time other than the established comprehensive evaluation date. However, the period of this interim accreditation of individual programs will not normally extend beyond the next scheduled comprehensive evaluation and accreditation date. The institution will be required to submit a questionnaire which would address only the program or programs to be evaluated.

IV.C.6. If, for any reason, the future of an accredited program appears precarious, or if definite weaknesses exist which should be strengthened, accreditation may be denied or withdrawn, or may be granted for a shorter period, usually two or three years. Such precarious conditions include uncertainty as to financial status, uncertainty due to nature of administrative organization, need for additions to or improvements in staff or equipment, a new or changing program, undue dependence upon a single individual, etc.

IV.C.7. ABET is authorized by its constituent organizations to publish a list of accredited engineering technology programs for use as desired by those agencies which require such a list. The list of programs which have been accredited by TAC of ABET is revised annually.

IV.D. Changes During Periods of Accreditation

IV.D.1. It is the obligation of the administration officer responsible for the engineering technology program at the institution to notify ABET of any changes in content and/or title of curriculum during the period of accreditation and to submit catalog revisions of accredited programs to ABET when the catalog revisions are published.

IV.D.2. TAC of ABET must be kept informed of program terminations and other significant changes in programs, staff, facilities, organization, enrollment, and other pertinent factors in institutions where engineering technology programs currently are accredited. If an accredited program is terminated by an institution, accreditation by TAC of ABET is automatically terminated at the same time.

IV.D.3. TAC of ABET will re-examine an accredited program should a finding of possible need be made during the normal term. The purpose is to protect the public interest by ensuring that the institution observes common canons of professional conduct in its operations. Upon receipt of information showing a possible cause for complaint, TAC of

ABET will institute procedures that include one or more of the following steps:

IV.D.3.a. Advise the chief executive officer of the institution of the complaint and request information on the matter.

IV.D.3.b. Develop understandings with institutional officials as to the situation, its problems, and alternatives for relief.

IV.D.3.c. Present the matter to the Executive Committee of TAC of ABET for procedural advice and direction.

IV.D.3.d. Develop a plan of operation for response by the institution concerned, with an objective of providing mutually acceptable and equitable processes.

IV.D.3.e. Submit the cases as resolved or as needing decision to the Executive Committee or to the full commission.

IV.D.3.f. If a complaint is considered serious enough to warrant revocation of accreditation, the provisions of paragraph II.B. under POLICIES will be invoked.

V. GENERAL ACADEMIC CRITERIA

V.A. Program Content and Orientation

V.A.1. Programs must have written goals which are consistent with overall institutional goals. These goals must, as a minimum, focus on the student body served, resource allocation, and other factors directly affecting the program. Articulation of goals should be accomplished through specification of objectives by which achievement toward goals can be measured. Programs must demonstrate achievements through various methods, e.g., student outcome assessments, graduate career performance and employer feedback.

V.A.2. Programs must have plans for continuous improvement. The visiting team will be looking for evidence which demonstrates implementation of continuous improvement processes and procedures for each program.

V.A.3. The program content should provide an integrated educational experience directed toward development of the ability to apply pertinent knowledge to the solution of practical problems in the graduate's engineering technology specialty.

ABET requires a high degree of specialization for engineering technology programs with field orientation rather than task orientation. The technical orientation of specialization should be manifested by faculty qualifications and course content.

V.B. Program Level and Course Requirements

Engineering technology programs may be accredited at the associate degree level or at the baccalaureate level. Differential criteria are specified as the minimum course requirements for each level. This section of the criteria relates to the program performance in producing graduates from programs meeting minimum course criteria.

V.B.1. Accreditable associate degree programs must be characterized by the following minimums in course requirements:

V.B.1.a. A minimum of 64 semester hour credits or 96 quarter hour credits for a two-year associate degree.

V.B.1.b. Thirty-two semester hour or 48 quarter hour credits of technical courses including technical sciences, technical specialties, and technical electives.

V.B.1.c. Sixteen semester hour or 24 quarter hour credits of an appropriate combination of basic sciences and mathematics of the type, level, and subject coverage specified in these criteria and applicable program criteria. The basic sciences component must include at least 4 semester hour or 6 quarter hour credits in areas specified in section V.C.4.b. below. The mathematics component must include at least 8 semester hour or 12 quarter hour credits in areas specified in section V.C.4.c. below. The remainder of the requirement may be met by appropriate course work in either basic sciences or mathematics. Course work is computer programing may not be included in the category of basic sciences and mathematics in satsfying the minimum quantitative requirements.

V.B.1.d. Nine semester hour or 13 quarter hour credits consisting of social sciences and/or humanities and instruction in written and oral communications appropriate to the program, of which at least 6 semester hour or 9 quarter hour credits are the study of communications. Some study in social sciences and/or humanities must also be included in the total requirement.

V.B.1.e. The balance of the program should be designed to achieve an integrated and well-rounded engineering technology program. The additional time is available for the implementation of the educational objectives of the institution and/or individual as they relate to ensuring adequate educational preparation for the graduate to function as an engineering technician. This includes the ability to use the computer in solving technical problems. Additional course work in engineering technology or related areas will be needed to fulfill such an objective. The institution must address such needs and objectives in developing the program and its contents. A maximum of four semester hours or six quarter hours of cooperative education experience, to enhance the skills of the technician, may be included in this portion of the curriculum toward meeting the minimum number of credit hours specified in section V.B.1.a. above, provided it meets the requirements of section V.C.7. below.

V.B.2. Accreditable baccalaureate programs must be characterized by the following minimums in course requirements:

V.B.2.a. A minimum of 124 semester hour credits or 186 quarter hour credits for a baccalaureate degree.

V.B.2.b. Forty-eight semester hour or 72 quarter hour credits of technological courses including technical sciences, technical specialties, and technical electives.

V.B.2.c. Twenty-four semester hour or 36 quarter hour credits of an appropriate combination of basic sciences and mathematics of the type, level, and subject coverage specified in these criteria and applicable program criteria. The basic sciences component must include at least eight semester hour or 12 quarter hour credits in areas specified in section V.C.4.b. below. The mathematics component must include at least 12 semester hour or 18 quarter hour credits in areas specified in section V.C.4.c. below. The remainder of the requirement may be met by appropriate course work in either basic sciences or mathematics.

V.B.2.d. Twenty-four semester hour or 36 quarter hour credits consisting of social sciences and/or humanities and instruction in written and oral communications appropriate to the program, of which at least nine semester hour or 13 quarter hour credits are the study of communications and at least eight semester hour or 12 quarter hour credits are in social sciences and/or humanities. The remainder of the requirement may be met by appropriate course work in either area.

V.B.2.e. The balance of the program should be designed to achieve an integrated and well-rounded engineering technology program. The additional time is available for the implementation of the educational objectives of the institution and/or the individual as they relate to ensuring adequate educational preparation for the graduate to function as an engineering technologist. This includes the ability to use the computer in solving technical problems. Additional course work in engineering technology or related areas will be needed to fulfill such an objective. The institution must address such needs and objectives in developing the program and its contents. A maximum of eight semester hours or 12 quarter hours of cooperative education experience, to enhance the professional development of the technologist, may be included in this portion of the curriculum toward meeting the minimum number of credit hours specified in section V.B.2.a. above, provided it meets the requirements of section V.C.7. below. However, no more than half of the maximum (four semester or six quarter hours) co-op credit may be counted in the upper division (junior/senior years) of the program.

V.B.3. ABET encourages innovative or novel program arrangements. Non-traditional programs will be evaluated against the above criteria to ascertain that the programs satisfy the intent of the minimums established.

V.C. Curriculum Elements

The quantitative criteria listed in V.B.1. and 2. above are now discussed as providing a minimum foundation for the preparation of an engineering technician or engineering technologist.

V.C.1. Technical Sciences--Subject matter in an engineering technology program has its roots in mathematics and basic science and carries knowledge further toward application. Courses are designated to supply the core of technological knowledge students need in their chosen profession. The same subject areas are included, with more emphasis on application than the "engineering science" of an engineering program.

V.C.2. Technical Specialties

V.C.2.a. Technical Skills and Techniques —These are courses in which the student would acquire the necessary skills and knowledge of appropriate methods, procedures, and techniques, such as graphics, problem solving, processes, construction techniques, instrumentation techniques, production methods, field operations, plant operations, safety, and maintenance. Technology laboratory manuals, experiments, projects, and activities should clearly reflect the orientation of the program toward the education of the student in the modern techniques of applied design, construction, operation, maintenance, testing, and some production processes. Among courses requiring laboratory work, sufficient written documentation of that work (such as formal reports, technical briefs, and engineering logbooks) is required to ensure that students become competent in communications. The documentation should be graded with respect to both technical content and writing skills.

V.C.2.b. Technical Design Courses — These are courses in practice-oriented standard design applied to work in the field, such as construction, in which students acquire experience in carrying out established design procedures in their own areas of specialization. The key to this type of technical design lies in the fact that the courses would follow established design concepts developed by engineering and that there would be prime emphasis on standard design procedures and practices. Many of these design methods have already been included in handbooks or standard computer methods for various branches of engineering. These courses would require an understanding of the application of mathematics and science, for example, to such activities as air conditioning systems design, duct design, piping design, amplifier design, computer component and circuit design, plant layout, materials handling operations, and/or civil engineering technology applications such as road design.

V.C.3. Technical Electives —Technical electives include any related technical courses which support the student's career interest (e.g., electronic circuits for a student in mechanical engineering technology).

V.C.4. Basic Sciences and Mathematics

V.C.4.a. Allocations within this group between basic sciences and mathematics will depend partly upon the specific program needs. For example, electronics might require a higher fraction of the total in mathematics than environmental engineering technology, which may have a greater basic sciences requirement. Courses in computer programming may *not* be included in the category of basic sciences and mathematics in satisfying the minimum quantitative requirements.

V.C.4.b. Basic Sciences — In a study of science, the objective is to acquire fundamental knowledge about nature and its phenomena. Toward this end, the courses should emphasize the understanding, measurement, and quantitative expression of the phenomena of nature. Laboratory work, including experimentation, observation, and accurate measurement, is a required part of the study of physical science. The basic sciences component of an engineering technology program may include physics, chemistry, and the life and earth sciences in accordance with specific program needs.

V.C.4.c. Mathematics

V.C.4.c.1. College algebra is the normal beginning point for the study of mathematics in engineering technology programs, and is the basis for the specified minimum mathematics credit and competence requirements. (See sections V.B.1.c. and V.B.2.c. above.) Program requirements should include carefully selected topics, suited to the individual program, from algebra through trigonometry to higher levels of mathematics. Competence in the application of algebra and trigonometry to problem solving must be demonstrated in appropriate technical courses.

V.C.4.c.2. In baccalaureate programs, particularly, the study of the concepts of calculus must be included in the program to ensure that students are professionally literate. Upper-level technical courses must include applications of calculus in technical problem solving where appropriate in the curriculum.

V.C.4.c.3. Study of the concepts of calculus must also be included in associate degree programs unless alternative subjects in mathematics beyond algebra and trigonometry are specified in the appropriate specific program criteria as developed by the professional societies and approved by ABET. (See section VI. below.)

V.C.5. Communications, Humanities, and Social Sciences

V.C.5.a. Communications — Good oral and written communications are considered by ABET to be a necessary achievement of a college graduate. Technically trained individuals should not be considered educated regardless of the depth of their technical capability if they cannot communicate, both orally and in writing, their technical findings, thoughts, and philosophy to others around them. Since it is by practice that the real importance of a specific aspect of educational endeavor is demonstrated to the student, a good technical educator will insist that reports be neat, grammatically correct, and lucid. It must be evident to the visiting team that graduates are proficient in the use of the English language and have developed the ability to communicate ideas and understand those of others. Course work in English composition, including both written and oral presentation, literature, and especially technical writing, is appropriate for meeting the quantitative requirement. Moreover, the visiting team will be looking for evidence that both oral and written communications have been taken into account in the review and evaluation of student technical work.

V.C.5.b. Social Sciences/Humanities — It is important that the student acquire an appreciation and understanding of our rich cultural heritage, the complexities of interpersonal relationships, and understanding of the interrelationship between technology and society, and a system of values essential for intelligent and discerning judgments. There will be variation in the specific courses offered in this general area from institution to institution. This by no means minimizes the importance of these courses to broaden the student in the general education area. Skill courses such as physical education or military drill do not qualify as social-humanistic studies.

V.C.6. Computer Competency — Engineering technicians and technologists are dependent upon the computer to effectively perform their job functions. It is therefore essential that students acquire a working knowledge of computer usage. Instruction in applications of software for solving technical problems and student practice within appropriate technical courses is required for all programs. Additionally in Baccalaureate degree programs, instruction must be included in one or more of the computer languages commonly used in the practice of engineering technology. Following formal instruction or demonstrated proficiency in computing skills, baccalaureate students should gain experience using programming skills in technical courses to an extent appropriate for the discipline.

V.C.7. Cooperative Education Experience — TAC of ABET does not separately identify cooperative programs. However, flexibility in the development of appropriate work experiences, such as a formal cooperative program, as part of an engineering technology program is encouraged. Work experience components will be evaluated as part of the evaluation of an entire engineering technology program, but credit for work experience may not be counted toward the minimum credit hour requirements in the categories prescribed in sections V.B.1.b. through d. or V.B.2.b. through d. Cooperative course credit may be included in the balance of the program as specified in sections V.B.1.e. and V.B.2.e. Where cooperative education experience is counted toward meeting the minimum total number of credit hours specified in V.B.1.a. or V.B.2.a. above, the cooperative education experience must include an appropriate academic component such as a seminar or written formal report addressing the experience and the educational benefits derived therefrom. This academic component must be graded by the faculty of the department responsible for the program's technical content. Material relating to the academic component must be provided for the visiting team's review. (See section III.B.1.c.9.)

V.C.8. Remedial Work — Remedial courses, designed to remove deficiencies in the background of entering students, are inherently at a level lower than expected in college credit work. Such courses, particularly in the areas of mathematics and communications, are not to be used to meet the minimums in curricular content requirements.

V.D. Technical Currency

In engineering technology programs, technical currency is important and must be assured by such means as a competent and inquisitive faculty, an active industrial advisory committee, an adequately funded budget which encourages continuing faculty development, and a modern library collection with an adequately funded program for continuous renewal. Positive procedures must be established and closely monitored to safeguard against technical obsolescence. These procedures should be described in the self-study questionnaire and demonstrated to the evaluation team during the visit.

V.E. Arrangement of Baccalaureate Programs

V.E.1. Some baccalaureate engineering technology programs have been developed using a single continuous four-year curriculum structure; others are organized on a "two plus two" or a "three plus one" plan wherein upper level studies are added to associate-degree-level work to form a baccalaureate degree program. The latter arrangement provides a specific associate degree exit with a concomitant job opportunity and also allows students the possibility of continuing their education toward a baccalaureate degree. The post-associate degree portions of the baccalaureate programs, hereafter referred to as upper-division-programs, vary considerably depending upon objectives. Some focus on continuation of the associate degree technical specialty whereas others are deliberately broader and may be considered interdisciplinary engineering technology programs. Considering the variety of legitimate local circumstances that may apply, these plans as well as others are acceptable if the total baccalaureate program reflects adequate work beginning at the freshman level and extending through the senior-level courses.

V.E.2. Upper-division programs generally accept students from TAC of ABET accredited associate degree programs. Students from nonaccredited associate degree programs should have appropriate validation of their work. It is expected that those students with deficiencies in their background preparation for the upper-division programs will be required to remove those deficiencies. In all cases, the accreditation process is intended to ensure that the graduate has achieved a level of competence expected in a baccalaureate program. Equivalence of courses and equivalence of credit hours must be determined by the receiving institution.

V.E.3. For those upper-division programs that continue the technical specialty, the courses should be structured on a "building block" basis, i.e., the advanced courses in the technical specialty should have as prerequisites the technical courses including mathematics from the associate degree program. These courses should obviously demonstrate a greater degree of sophistication and theory than those in the associate degree program.

V.E.4. For the "interdisciplinary" upper-division program, the technical courses must be designed with the student's academic background in mind. That is, it would be expected that a technical course at the junior level would cover more material and utilize greater mathematics content than a similar course at the freshman level in a specialty area. The "interdisciplinary" program must be clearly identified with an appropriate title.

V.E.5. Under no circumstances should an upper-division program that is predominantly management oriented be considered an engineering technology program, nor should two associate degree programs back-to-back be considered for baccalaureate accreditation.

V.F. Faculty

This section of the criteria relates to the technical faculty members' adequacy in credentials, numbers, and competence. The technical faculty, which may be the single most important factor in an educational program, will be evaluated individually and as a whole. For those programs which incorporate evening or off-campus offerings, the evening and off-campus faculty members are considered as part of the overall program faculty and must satisfy the provisions of this section of the criteria. Strong programs will have technical faculty members whose qualifications exceed what is described here as "basic credentials."

V.F.1. Each program must have appropriately qualified technical faculty members. Basic credentials are prescribed to assure the program is appropriately quantitative in nature and includes proper engineering and industrial emphases. A technical faculty member who has the following qualifications is viewed as having basic credentials with regard to technical competence, degree level, and industrial experience. Basic credentials consist of three years of relevant industrial experience and one of the following:

V.F.1.a. A master's degree in engineering or engineering technology, which is considered as the appropriate terminal degree.

V.F.1.b. A master's degree in a closely related field if the degree is primarily analytical and the subject clearly appropriate, e.g., a degree in physics for certain areas of electronics.

V.F.1.c. Professional registration and a master's degree.

V.F.1.d. For associate degree programs only, professional registration.

V.F.2. In exceptional cases there may be technical faculty members who satisfy the intent of the above minimums without literally satisfying the criteria. TAC of ABET may recognize these exceptions if the institution convincingly demonstrates the equivalence.

V.F.3. Technical faculty members not satisfying paragraph 1 must have at least a bachelor's degree in an appropriate science or engineering-related field. Faculty members teaching the technical skills courses are not required to have advanced degrees but are expected to be artisans or masters of their crafts. However, they should represent only a small fraction of the total engineering technology faculty.

V.F.4. The number of faculty members needed in a program depends on the number of students in the program, the portion of students in evening or co-op programs, other duties assigned to the technical faculty and the teaching support the program receives from related programs. The number of faculty members must be great enough to provide a breadth of perspective, program continuity and proper frequency of course offerings. In establishing the Full-Time Equivalents (FTE) listed below, faculty members whose primary commitment is to a program count fully for that program unless the institution chooses to divide their time between programs. No single faculty member can total more than one FTE, even if an overload is carried for extra compensation.

V.F.4.a. Each associate degree program must have at least one faculty member with basic credentials whose primary commitment is to the program and a total of at least two FTE faculty members.

V.F.4.b. Each baccalaureate degree program must have at least two faculty members with basic credentials whose primary commitment is to the program and total of at least three FTE faculty members.

V.F.4.c. Each upper-division only baccalaureate degree program must have at least one faculty member with basic credentials whose primary commitment is to the program and a total of at least two FTE faculty members.

V.F.4.d. Closely related programs often share faculty members, facilities, and courses which enable them to satisfy the intent of paragraphs a. through c. with fewer faculty. Programs may be recognized as closely related if they share administrative and support services and if at least 50 percent of the technical courses are common. Each dependent closely related program must have at least one additional faculty member with basic credentials whose primary commitment is to the program.

V.F.4.e. If an institution convincingly demonstrates that breadth of perspective, program continuity, and proper frequency of course offerings are provided by alternate means, exceptions to items a. through c. may be considered.

V.F.5. Not only does a technical faculty require minimum numbers to adequately carry out its task, the group also must have balance, variety, and overall strength. For an associate degree program at least one-half of the FTE faculty must have basic credentials. For a baccalaureate degree program at least two-thirds of the FTE faculty must have basic credentials.

V.F.6. Engineering technology education emphasizes problem solving, laboratories, and technical skills. A sufficient number of faculty members are required to give adequate attention to each student in this environment. The student-faculty ratio depends on the nature of the program and courses, but should not exceed the institutional ratio in science-related areas. Student-faculty ratios for non-technical studies should follow normal institutional patterns.

V.F.7. Each accredited program must have a full-time faculty member assigned as department head, program coordinator, or similar term designating leadership responsibility. This faculty member should have basic credentials.

V.F.8. The overall competence and effectiveness of faculty members may be judged by such factors as the level of academic achievement; the diversity of their backgrounds; the extent to which they further their own education in relevant areas; industrial experience; teaching experience; being technically current; interest in and enthusiasm for improving instruction; involvement in laboratory development; publication and other scholarly activities; active participation in professional and scientific societies; favorable evaluations from students, graduates, and peers; the ability to communicate effectively in English; exemplary ethical and professional behavior; and involvement with students in extracurricular activities. A master's degree is viewed as the appropriate terminal degree.

V.F.9. The field of technology is changing rapidly. Thus, the currency of material being taught and the people teaching the material are of paramount concern to TAC of ABET. Faculty members must maintain current knowledge of their field and understanding of the tasks industry expects technicians and technologists to perform. Faculty members normally remain current by active participation in professional societies; reading the literature; continuing education; applied research; consulting and periodic return to industry. The institution should have a well-planned, adequately funded, and effective program for the professional development of its faculty.

V.F.10. Many factors may prevent an institution with accredited programs from changing its faculty composition to satisfy the requirements which were initially implemented in 1990-91. Programs continuously accredited since 1989-90 with employment constraints that prevent present full compliance with section V.F. of the ABET criteria, may be accreditable if it is demonstrated that present engineering technology faculty members are technically current and that faculty members hired since 1990-91 hold the basic credentials specified in section V.F.1.

V.G. Student Body

This section of the criteria relates to the admission of students, school policy on scholastic work, and the adequacy of operations for student advising, selective retention, and application of graduation requirements.

V.G.1. Entrance requirements should include high school graduation or the equivalent.

V.G.2. Institutional policies and procedures on credit for scholastic work (including transfer credit), retention, probation, and graduation must ensure that all graduates of a program accredited by TAC of ABET meet these criteria in addition to satisfying all program and institutional requirements.

V.G.3. Proper academic advising must be provided to ensure that students are adequately prepared to meet the requirements of the program.

V.G.4. The institution must maintain up-to-date admissions and academic records for all students and graduates.

V.G.5. Adequate placement services must be available to assist graduates in seeking employment.

V.H. Administration

The administration should demonstrate effective leadership and satisfactory support for engineering technology. The following factors relate to this provision.

V.H.1. A capable faculty can perform its functions best in an atmosphere of good relations with the administration. This requires good communication between faculty members and administrators, and a mutual concern with policies that affect the faculty.

V.H.2. The college administration should have four basic roles: selection, supervision, and support of the faculty; selection and supervision of the students; operation of the facilities for the benefit of the faculty and students; and interpretation of the college to members of the profession and to the public.

V.H.3. In performing many of these functions, the administrators should not operate alone, but should seek advice from individual faculty members, faculty committees, and special consultants.

V.H.4. Each program in engineering technology must have an identifiable, qualified person who has direct responsibility for program coordination and curriculum development. Such a person must be a full-time employee of the institution as specified in section V.F.7.

V.I. Satisfactory Employment

One of the distinguishing features of engineering technology programs is the desire to provide their graduates with enough acumen that there will be a minimum training period required in industry. An accreditable program must demonstrate employer satisfaction with recent graduates, graduate satisfaction with employment, career mobility opportunities, appropriate starting salaries, and appropriate job titles. Evidence of the above must be made available to the evaluation team during the visit.

V.J. Industrial Advisory Committee

V.J.1. Each accredited program must have an industrial advisory committee composed of industrial representatives, which must meet at least annually. Records and minutes of this committee should be maintained and be made available to the accreditation evaluation team. Industrial advisory committees can contribute significantly to the growth and development of engineering technology programs as a means of assuring technical currency of the program and maintaining close liaison with the supporting and employing industries.

V.J.1.a. An effective industrial advisory committee should:

V.J.1.a.1. Be broad-based and composed primarily of practicing engineers and senior engineering technicians with active interests in the institution and the program it offers and with intimate knowledge of the current work of engineering technicians and the work they are likely to do in the near future.

V.J.1.a.2. Meet regularly with the administration and the faculty to discuss program needs, progress, and problems, and to recommend solutions.

V.J.1.a.3. Periodically review program offerings and course content to ensure that the current and future needs of engineering technicians in industry are being met.

V.J.1.b. Industrial advisory committees should also be encouraged to:

V.J.1.b.1. Assist in the recruitment of a competent faculty and of potentially capable students.

V.J.1.b.2. Assist in the placement of graduates.

V.J.1.b.3. Assist in obtaining financial aid and part-time employment for needy students.

V.J.1.b.4. Assist in obtaining financial and material resources for the institution and in assuring a high level of community awareness and support of the program offerings.

V.J.2. To be effective, advisory committees must be properly supported, logistically and administratively. They should be given meaningful assignments that are properly within their areas of expertise, and their advice must be given serious consideration. Whenever their advice cannot be taken, such decision must be supported by good reasons.

V.K. Financial Support and Facilities

The institution must demonstrate that adequate facilities and financial support for each program are available. The following factors delineate the nature and degree of the support required.

V.K.1. ABET is concerned that financial and facility provisions are adequate as predictors of continuing quality in education and evidence of program stability. Faculty salaries sufficient to attract desirable candidates for open positions and to provide a reasonably stable staff at the institution and within technology departments are a major factor.

V.K.2. Adequate facilities in classrooms and laboratories are central to effective achievement of educational goals. Provisions for updating equipment in response to changing practices in technology is important. The availability of sufficient expendable materials to give students proper learning experiences is another essential to achieving goals. Laboratory manuals, experiments, and projects should clearly indicate that the facilities are being used to educate the student in modern techniques of applied design, construction, operation, maintenance, testing, production processes, etc.

V.K.3. It is particularly important that instruction in engineering technology be conducted in an atmosphere of realism. Theory courses should stress problem identification and solution, with emphasis on the quantitative, analytical approach, including the making of "order of magnitude" estimates quickly. They should be accompanied by coordinated laboratory experiences, including measurement, collection, analysis, interpretation, and presentation of data.

V.K.4. Laboratory equipment and computers should be of the type that would be encountered in industry and practice. Since one of the objectives of engineering technology programs is the development of technical skills, all students should be thoroughly familiar with the use and operation of analytical or measurement equipment common to their major field of study. Experience in the operation of standard or basic shop equipment such as lathes, welders, and engines does not, in itself, meet this requirement.

V.K.5. Equipment catalogs, professional magazines, journals, and manuals of industrial processes and practices should be readily accessible and used by technology students in addition to the usual library resources. Students should be familiar with the literature of their technology and encouraged to use it as a principal means of staying abreast of the state of the art in their technological field. Library usage is one indication of faculty interest in developing student skills in locating and utilizing information. Library holdings must include a sufficient number of appropriate books, periodicals, reference books and indexes, and standards documents to support the engineering technology programs. Library holdings may be in paper, microform, or electronic formats. Resources owned by the institution and physically present in the library may be supplemented by other resources, such as electronic information databases and full-text document delivery systems, which are not physically present in the library but which have been licensed for access via online networks.

V.K.6. Satisfactory secretarial/clerical support must be provided for the engineering technology faculty and administration.

V.K.7. Satisfactory procedures and/or qualified support personnel for repair and maintenance of laboratory and other instructional equipment and for general laboratory assistance must be provided.

V.L. Further Information

Information about accrediting engineering technology programs may be obtained from the World Wide Web at http://www.abet.org.

Written requests for further information relative to ABET and the engineering technology accrediting program may be addressed to the Accreditation Director for Engineering Technology, Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202.

VI. Program Criteria

Program criteria relative to the accreditation of engineering technology programs in particular disciplines are developed by the cognizant Participating Bodies of ABET or, at the request of TAC of ABET, by other societies or groups having appropriate expertise. The program criteria provide the specificity needed for interpretation of the general criteria as applicable to a given discipline. Program criteria must be accepted by the TAC and by ABET before they can have effect in the accreditation process. When approved, program criteria are published in this section as an integral part of this document. A program in a curricular area covered by approved program criteria must be in compliance with both the general criteria and the program criteria in order to be accredited. Provisions of the program criteria may be more restrictive than related provisions of the general criteria. Engineering technology programs in areas not covered by program criteria must meet the general criteria.

Program criteria amplify or interpret specific sections of the general criteria for programs in particular engineering technology disciplines. **The participating bodies of ABET will review and recommend updating of their respective Program Criteria at least every six years. If not revised/reviewed, that Program Criteria will be deleted.**

The program criteria which follow have been developed by the appropriate Participating Bodies of ABET, reviewed by the Technology Accreditation Commission (TAC), and approved by the Board of Directors of ABET. Before being adopted for implementation in the accreditation process they were published for review and comment. They will be applied by the TAC for accreditation actions during the 1995-96 academic year and following years.

Participating Bodies of ABET having responsibility for assigned curricular areas periodically propose non-substantive or editorial changes to the program criteria. Upon approval by the ABET Board of Directors, such changes will be published and placed in effect without advance publication for comment.

Last modified: June 29, 1998

VI.M. PROGRAM CRITERIA FOR MANUFACTURING ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Submitted by the Society of Manufacturing Engineers
(Reviewed 1995)

1. Applicability.

These program criteria apply to engineering technology programs including "manufacturing" and similar modifiers in their titles, leading to either an associate or a bachelor's degree.

2. Curriculum.

(Amplifies general criteria section V.C.)

Concepts of quality management and of continuous improvement must be integrated throughout the manufacturing program.

a. **Technical Sciences.** (Amplifies criteria section V.C.1.)

(1) Technical science instruction must be problem-solving oriented with the majority of courses having laboratories to reinforce understanding the principles and applications. Technical science instruction must demonstrate the use of mathematical and basic science principles and computer applications learned in prerequisite or co-requisite study.

(2) For the associate degree, it must be evident to the evaluation team that students are proficient in the following technical science areas: application of computer software, engineering materials, statics and strength of materials, and electronic and electric circuits and devices. Instruction in these areas is required to satisfy the quantitative requirements.

(3) For the baccalaureate degree, it must be evident to the evaluation team that students are proficient in all of the technical science areas enumerated for an associate degree and in at least two of the following areas: fluid mechanics or fluid power, dynamics, thermodynamics or heat transfer, control systems, instrumentation, or microprocessors or data management. Instruction in these areas is required to satisfy the quantitative requirements.

b. **Technical Specialties.** (Amplifies criteria section V.C.2.)

(1) It must be evident to the evaluation team that technical specialty instruction is preparing the associate degree graduate for employment and include sufficient depth to enable the student to continue in upper-division studies. Sequential courses must provide increasing depth. Technical specialty instruction should incorporate mathematical and basic science principles and computer applications learned in prerequisite or co-requisite study. Technical specialty instruction must incorporate use of reference material selected from those routinely used in industry.

(2) For the associate degree, it must be evident to the evaluation team that students have attained proficiency in technical graphics, quality control, and

appropriate manufacturing processes and at least in one of the following technical specialties: automation, industrial organization and management, or manufacturing planning. The associate program must have at least one sequence of two or more courses using a prerequisite structure. Instruction in these areas is required to satisfy the quantitative requirements.

(3) For the baccalaureate degree, it must be evident to the evaluation team that students have attained proficiency in technical graphics, quality control and appropriate manufacturing processes, automation, computer- aided-manufacturing and engineering cost analysis, and in at least three of the following technical specialties: tooling systems, industrial organization and management, material management, metrology, manufacturing information systems, manufacturing planning, maintenance management, or environmental health and safety. The baccalaureate program must have at least three sequences of two or more courses in different subject areas, with each sequence having prerequisite structures. Instruction in these areas is required to satisfy the quantitative requirements.

(4) The institution must demonstrate that the manufacturing specialties included in the curriculum are technologically current and appropriate to the goals of the program.

(5) Through the "capstone" course(s) in the final year, the baccalaureate program must demonstrate that the goals of the program have been met, by drawing together several major elements of the design and production process. This experience should be project-oriented and comprehensive in utilizing prior instruction.

c. Basic Sciences and Mathematics. (Amplifies criteria section V.C.4.)

(1) The basic sciences must include physics with laboratory experience.

(2) For the baccalaureate degree, the basic sciences must also include chemistry.

(3) For the associate degree, the study of the concepts of statistics may be substituted for the concepts of calculus.

(4) For the baccalaureate degree, appropriate technical instruction must include applications of statistics.

VI.L. PROGRAM CRITERIA FOR INDUSTRIAL ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Submitted by the Institute of Industrial Engineers
(Reviewed 1995)

1. Applicability.

These program criteria apply to industrial engineering technology programs, and those with similar modifiers in their titles, leading to either an associate or a bachelor's degree. (Note: programs in *industrial technology*, as distinct from industrial *engineering technology*, are not accredited by TAC of ABET.)

2. Curriculum.

a. **Technical Sciences.** (Amplifies criteria section V.C.1.)
A student must have knowledge of probability, statistics, engineering economic analysis, and cost control. Other essential technical sciences of which some topics must be included are material science, computer science, mechanics of solids/fluids, thermodynamics or heat power, metrology, and electricity/ electronics.

b. **Technical Specialties.** (Amplifies criteria section V.C.2.)

(1) There should be a core of courses in industrial engineering technology covering skills and techniques in time/motion study, plant layout, materials handling, production control, statistical quality control, wage/salary administration, CPM/PERT, organization/management, and work simplification. Instruction in tool engineering technology, manufacturing processes, inventory control, simulation, robotics, numerical control, CAD/CAM, system/procedure analysis, optimization techniques, and software design would be helpful and appropriate. Courses at the associate degree level must prepare the student for immediate employment but must include sufficient depth to enable the student to continue in upper-division studies without penalty. Upper-division course work must complement and expand on lower-division work.

(2) The last year of the program should include a project or capstone course to integrate the knowledge learned in the technical specialties and gain experience in the art of practicing industrial engineering technology.

FERRIS STATE UNIVERSITY

TO: FSU Community
FROM: William A. Sederburg, President
SUBJECT: Summary of Summer University Planning Activities
DATE: September 1, 1998

Scores of people have participated in a variety of planning activities throughout the summer. On July 16, more than sixty people attended the Summer Planning Summit at the Holiday Inn hosted by the University Planning Committee (UPC). The group was composed of representatives from the Board of Trustees, the Executive Cabinet, the Leadership Council, the Academic Senate Executive Board, the Deans' Council, the UPC, the Student Government, the FSU Alumni Association's Executive Board, the Ferris Foundation Executive Board, Kendall College of Art & Design, and local businesspersons.

The morning session of the Planning Summit included presentations that focused on direct points of the FSU "Comprehensive Planning Document" which included a mission statement, a vision statement, core values, environmental assessments, strategic planning, and evaluation processes. These components were developed in accordance with the Board's priorities of fiscal health, educational management, growth-oriented leadership, and rebuilding the campus. The afternoon roundtable discussions further refined the thinking presented in this document and resulted in updated long-term strategic issues, goals, and objectives. They were identified as:

- Issue One: Ferris State University must strategically grow to survive in the 21st century.
- Issue Two: Ferris State University must improve its position in higher education with more nationally recognized programs of study.
- Issue Three: Ferris State University must attract more resources to grow strategically.
- Issue Four: Ferris State University must improve the quality of its services in order to grow and attract new students.
- Issue Five: Ferris State University must improve and enhance its physical and technical infrastructure for students, faculty, staff, and community.

--over--

OFFICE OF THE PRESIDENT
1349 Cramer Circle, BIS 421, Big Rapids, MI 49307-2737
Phone 616 592-2500

These five issues were incorporated into the 7/22/98 version of the "Comprehensive Planning Document." On pages 12-15 of this document, each of these issues is listed along with its corresponding University goal and objectives. At its retreat on 8/7/98, the Board of Trustees supported the work of the University Planning Committee and the Summer Planning Summit by approving the following Resolution:

> *Resolved, that the Ferris State University Board of Trustees received, reviewed, and discussed the 7/22/98 draft document entitled "Defining the Future of Ferris State University: Comprehensive Planning Document" and hereby endorses its implementation.*

Reflecting the work of the UPC and the Summer Planning Summit, the Board indicated that the 1999-2000 University Planning Goals would focus on the following:

1. Grow enrollment strategically.
2. Enhance academic product development/positioning by improving academic leadership/management, developing an extended learning plan, and completing the Grand Rapids/Kendall merger and operation plans.
3. Develop more resources for the University; expand the visibility of the University and the President.
4. Continue quality improvement activities.
5. Continue budget and capital project management.

The identification of these short-term goals reflects the work of many dedicated individuals who devoted considerable time and effort to contribute to the success of our students. I greatly appreciate the widespread participation of those who were involved in "Defining the Future of Ferris State University." The "Comprehensive Planning Document" and the 1999-2000 University Planning Goals will guide our activities.