2004-2005

Questions for AAS in Manufacturing Tooling Technology Program Panel

The following questions or requests for information are the result of our discussion concerning specific statements or material within the AAS in Manufacturing Tooling Technology Program Panel document. The page number containing the material upon which the question is based is cited prior to the question.

How does this program different from the Manufacturing Technology program. Do your students ladder in to that program?

response Faculty: Manufacturing Technology is a 2 year program with a tooling focus. Manufacturing Engineering (MFGE) is a broad scope 4 year program. 60% of Manufacturing Tooling (MFGT) students transfer into MFGE, making our program the #1 feeder for MFGE.

Chair: MFGT. AAS 2-year optional engineering B.S. General

What is the number of new students entering the program each year?

response Faculty: Ranges from 30 - 40.

Chair: Admin program review

1-3 **Members of the Council noted that Jack Gregory is no longer at Ferris. Have you found a replacement? What impact has his leaving had on your program?**

response Faculty: Jack is no longer in the program; this places a giant dependency on adjunct faculty. Recently a job posting was prepared and is in the process.

Chair: Understudy - adjunct so far Review - loading future goals curriculum

1-4 **You offer courses at the Applied Technology Center. Are there any issues with GRCC and/or suitability of equipment for courses that we should know about?**

response Faculty: Applies only to MFGE.

Chair: No!

1-4 **What are the responsibilities of student assistants and laboratory aids in your courses? What is the source of income for these positions?**

response Faculty: Lab aids work to support MFGT related courses where the majority of students arrive without experience and knowledge. Other students are hired to run the tool crib for all courses. These positions are funded through _____ .

Chair: Program - College of Technology - Vice President

2-2 **In your graduate survey how many were sent out and how many were returned?**

response 113 graduate surveys were sent, 21 responded.

2-10 CNC is addressed frequently in the comments. Are you satisfied with the extent to which this is addressed in your curriculum?

response Faculty: CNC is adequately addressed in the lecture portion of the curriculum and the recent acquisition of CNC Milling equipment allows us to apply a great deal of new technology; however we have a very real need for updated CNC turning and EDM equipment.
Chair: Growth Mastercam

3-5 13-2 The employer survey mentions the possibility of offering a 4 year degree in your area. I you considering this possibility and if so, what is the rationale for this degree?

response Chair: Yes, we are working with Manufacturing Engineering (Joe Wist) other programs.

4-1 In your student survey how many were sent out and how many were returned?

response 26 surveys were sent and 12 returned.

5-1 Question 7 of the faculty survey suggests that the facilities are inadequate. What needs to be changed and what requests have you made, i.e. unit action plans.

response Faculty: Staging area needed. Serious need for climate control to keep the humidity level constant.
Chair: Staging Area and other school's G.O.

6-3 In question 9, your advisory committee gives a low rating to the plastic mold construction question. Do you have any insights why this is so?

response Faculty: Non-plastic based companies returned the survey.

7-3 The data suggests that the CNC workers earn 5 to 10dollars less than tool and die worker but that the job outlook is good for CNC but tool and die will show little growth. What is your prospective on the job outlook for your graduates?

response Faculty: CNC technology is an integral part of modern manufacturing and in the MFGT program we teach our student to utilize this technology and apply it in a productive manner. The monies represented in the data refers to CNC operators, a job that our graduates can easily perform, however we don't focus on machine operation, but rather how to apply and further develop advanced procedures and related technology. Our graduates are capable of not only applying CNC technology, but actually training the operators and developing new processes.
Chair: Problem here most companies hire these people internally.

8-1 Do you have reliable computer support?

response Faculty: Much improved over the past year.
Chair: Improved

8-1 Have the Safety issues mentioned been addressed?

response Faculty: No real issues.

9-1 Please clarify what you mean by alternative delivery method needs to be developed. How are you addressing the perceived need for continuity?

response Faculty: Need presentation capabilities (staging area).

10-2 In point 5 it mentions apprentice ship programs. Please describe these and indicate their relationship to your program.

response Chair:

10-2 In point 6 it indicates that there are the 5 full time 1 adjunct faculty. Are they solely devoted to this program or do they teach courses in other programs?

response Chair: There are 4 full time faculty. The option exists (MFGE 312 and 324)

10-3 How big of a problem is loss of students to industry? What impact does leaving school before earning a degree have on their careers?

response Faculty: Companies have worked with the MFGT faculty and have developed incentives for students encouraging them to finish their degree prior to accepting a full time positions in the field.

10-3 Please comment on the current demand for your program on the part of students compared to previous years.

response Faculty: The need for highly skilled MFGT graduates in the manufacturing tooling field has escalated in the past 3 years. Companies are experiencing difficulty finding, training and developing individuals with the talents that are required for the new and advanced technology that is now needed in order to compete globally. The traditional method of training and retaining individuals is no longer effective.

11-1 You have acquired considerable equipment over the years. How is the maintenance of equipment funded?

response Chair: S&E

12-2 Please clarify the comments in C.1 concerning the facility and expansion of lecture and lab activities.

response Faculty: Staging Plan (Please See Power Point Presentation)

MEMORANDUM

DATE: November 17 2004

TO: Academic Senate

FROM: Academic Program Review Council

RE: Recommendations for:

Associate of Science Degree in Manufacturing Tool Technology

CC: Louis Nemastil, Dean Krager, Gary Ovans, Charles Matrosic, Thomas Oldfield, Michael Harris

IDENTITY OF PROGRAM:

AAS Degree in Manufacturing Tool Technology

RECOMMENDATION OF ACADEMIC PROGRAM REVIEW COUNCIL:

We recommend that this program be Continued

CATALOG ENTRY:

Why Choose Manufacturing Tooling Technology?

Since its origination in 1956, the Manufacturing Tooling Technology program has developed a reputation as a national leader in the precision machining and tooling industries. In this program students develop a solid technical foundation through the direct application of precision machining and tooling processes.

Students learn to apply relative mathematical calculations; interpret engineering drawings and CAD data; utilize precision metrology equipment; plan machining processes; specify tooling and equipment requirements; utilize machining equipment including manual and CNC equipment; and apply metallurgical processes. Two CNC classes take students through 2-D manual G-code programming; 2-D and 3-D conversational programming; and complex 3-D CAD/CAM programming.

All Manufacturing Tooling Technology courses feature hands-on learning in well-equipped facilities. Lab time alone accumulates to nearly 1000 hours of direct, applied experience. Course projects focus on processing and problem solving and take students through the costing, designing, building, and production running of jigs and fixtures, metal stamping dies, and plastic molds.

Get a Great Job

Because nearly every manufacturing industry requires skilled professionals with a solid foundation in machining and tooling, graduates of the Manufacturing Tooling Technology program are in high-demand and have an array of options upon graduation.

Some of the occupations which provide an excellent match for program graduates immediately upon graduation include: Machinist; Tool and Die Maker; Die Maker; Mold Maker; Machine Builder; CNC Programmer; Manufacturing Technician; Quality Technician; and Technical/Sales Representative. With additional experience

and/or education, graduates often move into occupations such as Process Engineer, Tooling Engineer, Manufacturing Engineer, Project Engineer, and Technical Instructor, as well as all levels of management.

Graduates who decide to continue their education can stay at Ferris and, within two additional years, earn a bachelor's degree in one of many related programs.

Employment Opportunities

Job Placement for graduates consistently rates at the 99% - 100% level. Opportunities are available for students in both first and second years of the program to work with industry during holidays, breaks, and summers. Many companies are even hiring high school graduates that have enrolled in the Manufacturing Tooling Technology program prior to attending their first class. Contact the MFGT program faculty for additional information (231-591-2511)

Employers:

Aerospace, Automotive, Mold and Die Companies, Medical Instrument Manufacturers, Prototype Research and Development Organizations. Some of these include: Dana Corporation, Delta Airlines, Drawform, General Motors, Paragon, Phillips Plastics, Prince Corporation, Proctor and Gamble, Rand Corporation, Seal Power(Highlift Division), and Trans-matic. Employers for Manufacturing Tooling Technology graduates are found nation wide. The 1995 graduating class averaged six job offers per student with one student being offered jobs from 17 different companies. In 1996, two months before the end of the academic year, all of the second year graduating class entering industry and most of the first year students have already accepted fulltime positions or summer internships respectively.

Salaries:

Reported salaries place toolmakers as the 7th highest paid occupation in the United States directly following doctors and lawyers. Most of our first year students currently earn from $7.00 to $10.00 per hour. Our second year graduates typically earn from $10.00 to $20.00 per hour. Within two years of earning their degree, graduates have reported annual incomes of more than $50,000. Remember, this is with a two year Associate Degree in Manufacturing Tooling Technology from Ferris State University.

BACKGROUND INFORMATION OBTAINED FROM THE ACADEMIC PROGRAM REVIEW PROCESS:

CRITERIA SUMMARY BASED ON CONCLUSIONS OF THE PROGRAM REVIEW PANEL:

- **Centrality to FSU Mission**
  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."
  - The faculty and staff of Manufacturing Tooling Technology program pride themselves in offering courses that utilize unique and innovative projects allowing the students to learn by means of applying technology in real-world situations. It is this approach to teaching and learning that is most often noted by both graduates and employers.
- **Uniqueness and Visibility**
  - The Manufacturing Tooling Technology program is unique in that it is the only "tooling" focused program in Michigan and one of very few in the U.S. This program incorporates an applied technology approach to educating its students and since it's origin in 1956, it has developed a reputation as a national leader in the precision machining and tooling industries.

- **Service to State and Nation and World**
  - Graduates of this program are highly sought after and recruited by a variety of manufacturing based companies.
  - Although the majority of these companies are located within the Midwest, program faculty have noted a definite increase in recruiting contacts by major corporations both national and international.
- **Demand by Students**
  - The capacity is listed at sixty six. With the exception of the fall of 2001 enrollment has averaged approximately sixty students.
- **Demand for Graduates**
  - The Manufacturing Tooling Technology program is one of the top ranked programs in the state. There is a high demand for graduates of this program.
- **Placement Rate and Average Salary of Graduates**
  - One hundred percent of employed graduates are working in positions directly related to their major field of study, with the majority working throughout the Midwest.
  - MFGT graduates have one of the highest average starting salaries of all two-year programs at Ferris.
  - The 2002 survey shows that the average starting salary for the MFGT graduates is $34,725.00/yr. In 2004 the Bureau of Labor and Statistics indicates from a 2002 survey, that Ferris State University Manufacturing Tooling Technology graduates starting wages fall within the top ten percent on a national scale.
- **Service to Non-Majors**
  - The Manufacturing Tooling Technology program serves 7 related technology programs by way of the MFGT-150 course. This course provides students in related technology programs an opportunity to learn about basic manufacturing processes
  - CAD Drafting / Tool Design Technology students have an additional related course identified as MFGT-252. This course provides students a more in-depth experience in applying precision machining and tooling processes.
  - The MFGT lab equipment is utilized by other programs, particularly the Manufacturing Engineering Technology program, for the purpose of supporting the MFGE 311, MFGE-312, MFGE-322, MFGE-324, and MFGE-411 courses.
  - Being that the MFGT lab has all the capabilities of a full blown precision machine shop, the physical department depends on the MFGT lab for a variety of services.
- **Quality of Instruction**
  - Students are awarded advanced standing in companies' apprentice programs, and quanlify for more than 50 percent of the required 8000 hours of practical experience and application.
  - In apprentice programs, MFGT students are also awarded 100 percent credit toward theory and classroom requirements.
  - The program is reviewed on an annual basis by the faculty, alumni, and their advisory board to insure industrial relevance. With the assistance of their advisory board, the Manufacturing Tooling Technology program has been making gradual curriculum changes consistent with industry standards.
  - In 2002 the program conducted a nation-wide analysis of occupations related to manufacturing tooling technology. This analysis was used to develop a matrix for evaluating the program curriculum. Currently, program faculty are comparing the curriculum to this matrix in order to validate the curriculum. It is expected that this will prove very useful and be repeated on a 5 year cycle.

- **Facilities and Equipment**
  - Although the Manufacturing Tooling Technology lab facilities and equipment are, for the most part, adequate to support the majority of related activities, there are 4 areas of concern when it comes to further developing the program and integrating new technology.
    - An endowment was established several years ago for equipment funding; however, its growth has been less than desired.
      - MFGT faculty are currently working with Kaci Baars, Director of College Advancement, to develop a long term strategic plan to better market the endowment and grow it at a faster rate.
      - In addition to this, program faculty are in the process of reviewing applicable equipment grants from a variety of sources
    - The MFGT lab facility was constructed on the lowest piece of ground on campus (a natural drain for the surrounding land), so it tends to draw a reasonable amount of moisture.
      - This moisture has a very serious negative effect on the precision tooling and equipment. Currently, if precision tooling is left unprotected for more than a day, it will begin to oxidize.
      - Air conditioning would basically solve this problem and better meet the environmental conditions required for working with precision tooling.
      - This has been submitted as a UAP and capital improvement project.
    - Three years ago the program faculty realized the need for a lab staging area that would provide a "quiet area" for lab discussions / demonstrations as well as allow for the organized storage and display of teaching samples. This has been submitted as both a UAP and capital improvement project.
    - Currently program faculty are limited to the way in which they present their materials due to a lack of properly equipped rooms. This has been submitted as part of the "College of Technology Equipment List."
- **Library Information Resources**
  - The current library information resources are adequate.
- **Faculty: Professional and Scholarly Activities**
  - **Quantity and qualifications:**
    - There are currently 4 full-time tenured faculty members working in the Manufacturing Tooling Technology program.
    - All full time faculty hold an MS degree.
  - **Professional and scholarly activities:**
    - The program faculty participate in a wide variety of professional and scholarly activities including related research, developing and presenting specialty training seminars and workshops, and outside consulting services.
- **Administrative Effectiveness**
  - No information was provided.

COST INFORMATION:

According to the 2001-2002 report from institutional research:

Total cost per SCH

AAS Degree in Manufacturing Tool Technology	**$295.36**

Total program cost

AAS Degree in Manufacturing Tool Technology	**$20,084.64**

ASSESSMENT OF THE PROGRAM BY THE ACADEMIC PROGRAM REVIEW COUNCIL:

OBSERVATIONS:

- The Degree Program Cost Document for 2001-2002 published by Institutional Research and Testing lists all programs; 2 year, 4 year, graduate, and professional degrees in the same table.
- The AAS Degree in Manufacturing Tool Technology ranks 18/229 in programs at the University based on **total cost per student credit hour** ranked from high to low.
- The AAS Degree in Manufacturing Tool Technology ranks 79/229 in programs at the University based on **total program cost** ranked from high to low.
- This program requires intensive use of sophisticated equipment and a relatively small capacity in instructional laboratories.
- The Capacity in the program is 66.
- The on campus enrollment in the program is summarized below.

1998	1999	2000	2001	2002	2003	2004
57	67	64	47	57	61	

- The number of on campus graduates in the program:

1999	2000	2001	2002	2003	2004
15	15	23	21	10	11

- The Administrative Program Review states that 5 FTE were assigned to this program in the Fall of 2003.
- The Administrative Program Review states that .95 FTE were assigned overload/supplemental in the Fall of 2003.
- The graduate survey was sent to 113 graduates. A total of 21 surveys were returned for a 18.6 % return rate.
- A total of 4 employer surveys were returned.
- A survey was administered to 26 students. A total of 12 surveys were returned for a 46 % return rate.
- The Faculty survey was sent to 6 faculty. A total of 6 surveys were returned for a 100 % return rate.
- A Survey was sent to 8 advisory Board members. A total of 2 surveys was returned for a 25% return rate.
- A faculty member left the institution just prior to the start of the fall semester leaving the program short staffed.

STRENGTHS OF THE PROGRAM

- This program has well qualified and enthusiastic faculty
- The faculty is determined to remain at the cutting edge of the field
- The faculty is active in recruiting of new students
- The program has generous support from industry including scholarships for students
- The high quality graduates of this program fill an important role in the manufacturing industry

THE ACADEMIC PROGRAM REVIEW COUNCIL HAS THE FOLLOWING COUNCERNS:

- The enrollment is slightly below capacity
- The dependence of the program on state of the art equipment requires continual updating of equipment
- The program has a tenure track faculty line vacancy due to the unexpected departure of a faculty member this fall
- The program has instructional concerns related to the limitations of the Swann Building

THE ACADEMIC PROGRAM REVIEW COUNCIL RECOMMENDS THAT THE FOLLOWING STEPS BE TAKEN TO IMPROVE THE PROGRAM:

- The faculty should continue to work on identifying the appropriate target audience for recruitment of high quality students
- The faculty of the program should continue to work with the Department and the College of Technology to explore ways to continue to upgrade and maintain equipment in order to remain a leader in the field.
- The College of Technology should hire a tenure track faculty to replace the faculty member who left the University
- The faculty should continue to explore options with respect to meeting the need for a lab staging area
- The College of Technology should reevaluate the procedures used in distribution of S & E funding to programs and allocation of equipment funds to insure more equitable distribution of funds
- In view of the present state of the economy and the University priority list for construction of new facilities, the College of Technology should carry out a comprehensive review of the allocation of rooms in the Swann Building to determine if the current space is being optimally utilized

SELF STUDY FOR

ACADEMIC PROGRAM REVIEW

MANUFACTURING TOOLING TECHNOLOGY PROGRAM

ASSOCIATE IN APPLIED SCIENCE DEGREE

COLLEGE OF TECHNOLOGY
FERRIS STATE UNIVERSITY
BIG RAPIDS, MICHIGAN 49307

SEPTEMBER 10, 2004

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Table of Contents

SELF STUDY FOR
ACADEMIC PROGRAM REVIEW

MANUFACTURING TOOLING TECHNOLOGY PROGRAM
ASSOCIATE IN APPLIED SCIENCE DEGREE

COLLEGE OF TECHNOLOGY
FERRIS STATE UNIVERSITY
BIG RAPIDS, MICHIGAN 49307

SEPTEMBER 10, 2004

PROGRAM REVIEW PANEL

PROGRAM FACULTY

DENNIS FINNEY,
PROFESSOR, MANUFACTURING TOOLING TECHNOLOGY

JACK GREGORY,
PROFESSOR, MANUFACTURING TOOLING TECHNOLOGY

DOUG CHASE,
ASSOCIATE PROFESSOR, MANUFACTURING TOOLING TECHNOLOGY

LOUIS NEMASTIL, Program Review Co Chair / Report Assembly
ASSOCIATE PROFESSOR, MANUFACTURING TOOLING TECHNOLOGY

DEAN KRAGER, Program Review Co Chair
ASSISTANT PROFESSOR, MANUFACTURING TOOLING TECHNOLOGY

INDUSTRIAL PARTICIPANT

JOHN MACMILLAN,
MANUFACTURING OPERATIONS MANAGER, ILLINOIS TOOL WORKS (ITW)

FACULTY OUTSIDE C.O.T.

DR. KATHERINE MANLEY,
CENTER OF OCCUPATIONAL EDUCATION

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Program Profile – Section 1

Programs: Manufacturing Tooling Technology
Degrees: A.A.S.
Department: Manufacturing
College: College of Technology

I. Purpose of the program

A. Describe the goals and objectives of the program (refer to role and mission statement of the program).

Manufacturing Tooling Technology
Mission / Role Statement

"The Manufacturing Tooling Technology program is committed to excellence in teaching and learning for all students. We will provide effective instructional leadership, responsible fiscal management, and a quality learning environment, which improves student outcomes. The MFGT program holds high expectations for students in the precision metalworking, tool and die making, and moldmaking manufacturing process. The Manufacturing Tooling Technology faculty are determined to provide the student body with a program designed to challenge and develop the technical skills necessary for the graduates to succeed in a rapidly changing industry."

1. Provide students with quality education enabling them to enter third year apprenticeship programs or continue their education in one of the many baccalaureate degree programs for which they are eligible to enter.

2. Maintain a current manufacturing tooling facility that reflects the current state of the industry.

3. Accommodate nontraditional and transfer students working toward obtaining technology degrees.

4. Encourage good work ethics and professionalism by continued exposure to modern manufacturing process and facilities.

5. Promote faculty development through participation in graduate activities, workshops, and seminars.

6. To maintain a balance of general education courses, to insure competent communication skills, both verbally and written, computational skills, social awareness, and cultural enrichment.

The Manufacturing Tooling Technology degree is designed to prepare students to enter industry, trained to build tooling, machine components, support engineering and manufacturing activities and to provide them with the technical foundation required in the Manufacturing Tool Technology field.

B. How is the program compatible with the role and mission statement of FSU?

The program is compatible with the university mission by providing hands-on, laboratory based career education and training.

C. How is the program integrated /coordinated with other programs at FSU?

In addition to serving its majors, the Manufacturing Tooling Technology program provides courses for Plastics Technology , CAD Drafting and Tool Design Technology, Welding Technology, Manufacturing Engineering Technology, Product Design Engineering Technology, Mechanical Engineering Technology, Rubber Technology, and Automotive Technology. majors. **See Appendix A, Attachment 1**

Manufacturing Tooling Technology Resource Utilization Chart.

D. How is the program integrated /coordinated with programs at other institutions?

The Manufacturing Tooling Technology program accepts transfers from community colleges in/outside Michigan. During the past ten years, numerous colleges have transferred students into the program.

The Manufacturing Tooling Technology program has articulation agreements with community colleges, career tech centers, and high schools within the states of Michigan, Indiana, and Ohio.

E. How does the program serve society at the community, state, nation, and world?

The Manufacturing Tooling Technology program is one of the top ranked programs in the state. One hundred percent of employed graduates are working in positions directly related to their major field of study, with the majority working in Michigan. MFGT alumni have one of the highest average salaries of all two-year programs at Ferris. The 2002 survey shows that the average starting salary for the MFGT graduates is approximately $34,725.00/yr. In 2004 the Bureau of Labor and Statistics indicates from a 2002 survey, that Ferris State University Manufacturing Tooling Technology graduates starting wages fall within the top ten percent on a national scale. **See Appendix A, Attachment 2**

Department of Labor Statistics Chart.

The Manufacturing Tooling Technology program has assisted many other programs and organizations within this university and the community, which include: Heavy Equipment Service Engineering Technology, Automotive Technology, and Printing Management; university departments which include: Food Service, Plumbing, and Physical Plant; and community organizations including: Play Scape and Habitat for Humanity

II. Resources of the program

A. Personnel

1. *Faculty: List by rank with degrees (including year, field of study and institution, certificates, and/or related work experience.* **See Appendix A, Attachment 3 Faculty and Staff Resumes**

a. Faculty-Tenured

1. Dennis Finney, Professor, 1985
   M.S. Industrial Education, Eastern Michigan University
   M.S. Occupational Education, Eastern Michigan University
   B.S. Trade and Technical Education, Ferris State University
   A.A.S. Manufacturing Tooling Technology, Ferris State University

2. Jack Gregory, Professor, 1990
   PhD. Kennedy State University
   M.S. Occupational Education, Ferris State University
   B.S. Manufacturing Engineering Technology, Ferris State University
   A.A.S. Manufacturing Tooling Technology, Ferris State University

3. Doug Chase, Associate Professor, 1979
   M.S. Occupational Education, Michigan State University
   B.S. Trade and Technical Education, Ferris State University
   A.A.S. Manufacturing Tooling Technology, Ferris State University

4. Louis Nemastil, Associate Professor, 1997
   M.S. Technical Education, Ferris State University
   B.S. Trade and Technical Education, Ferris State University
   A.A.S. Manufacturing Tooling Technology, Ferris State University
   Certified Tool and Die Maker / United States Department of Labor

5. Dean Krager, Assistant Professor, 1999
   M.S. Technical Education, Ferris State University
   B.S. Trade and Technical Education, Ferris State University
   A.A.S. Manufacturing Tooling Technology, Ferris State University
   A.A.S. Technical Drafting / Tool Design, Ferris State University

d. Adjunct

As needed.

e. Department Chair

Gary Ovans, Professor, 1984
M.S. Occupational Education, Ferris State University
B.S. University Wisconsin-Stout
B.S. University Wisconsin-Eau Claire
Certified Manufacturing Engineer

2. FTE overload

FTE overloads are nominal as required for varying student numbers.

See Appendix A, Attachment 4
Course Overload Data Chart

MFGT 150 – Manufacturing Process
Credit Hours: 2 (1 Lecture: 3 Lab)

3. Off-campus programs: location and involvement of faculty

Off-campus courses that are available on demand:

MFGT 151 – Metal Stamping Process
MFGT 153 – Die Construction and Repair
MFGT 251 – Die Tryout
MFGT 253 – Die Estimating/Project Management

4. Administration: degrees (including year, field of study, and institution), certificates, and/or related work experience

Administration
Charles Matrosic, Interim Dean, College of Technology
M.S. Michigan Technological University
B.S. Metallurgy, Michigan Technological University

5. Support staff (clerical, technical,...)

One clerical and one technical support staff members are shared with other programs.

a. Linda Faysal, Department Secretary, Manufacturing Department, College of Technology supports Manufacturing and Welding Programs.

b. Bruce Hammond, Machine Lab Technician, Manufacturing Department, College of Technology supports the Manufacturing, Welding, and Printing programs.

6. Student assistants

Students assistants and laboratory aids are hired as required to support laboratory activities.

7. Advisory board: names, affiliations, and positions of the membership

Advisory board members. **See Appendix A, Attachment 5**
Advisory Board Membership List

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology
Graduate Survey – Section 2

Manufacturing Tooling Technology Alumni, Employer, Advisory Board Member

Since the 1980's, periodic academic program review has come to be seen as an essential part of curricular and institutional planning in higher education. Programs at Ferris State University with external accrediting agencies have always been required to produce self-study reports periodically. The 1987 North Central Association site visit team mandated that the institution develop a program review process for all academic programs at the University.

The goal of program review is to insure that the academic programs of the University achieve and maintain the highest possible standards of academic excellence. Based on a schedule that spans six years, every academic program will have the opportunity to examine itself using a variety of survey instruments and other measures. The resultant self-study will permit the program, department, college, Division of Academic Affairs, and the University to make informed decisions about curricular issues and resource allocations.

During the 2003/2004 academic year, the Manufacturing Tooling Technology program at Ferris will be reviewed. A vital part of the review process will be your professional input. Enclosed find a survey that we request you complete. Please return the NCS answer sheet and your written responses in the provided envelope by May 1, 2003. The survey should take 15-20 minutes to complete. Individual responses are confidential but the overall responses will be analyzed to help determine the status, trend, and future of the Manufacturing Tooling Technology program at Ferris.

Your participation in this survey is critical in order for us to get an accurate review of our Manufacturing Tooling Technology program. On behalf of the students and faculty of the Manufacturing Tooling Technology program, we thank you for your time and input.

Sincerely,

Manufacturing Tooling Academic Program Review Committee

Encl.

Manufacturing Tooling Technology
Program Content Application Survey

Program Graduate Survey

Use the answer sheet provided:

1. If you are a Manufacturing Tooling Technology Graduate (check A). Also, please answer questions 1-35 **A**

MANUFACTURING TOOLING A.A.S. PROGRAM

Please fill in the appropriate response to the following questions.

To what extent does a graduate require the course knowledge?

II. ***Please circle appropriate rating***

	To a Great Extent	Somewhat	Neutral	Very Little	Not at All
	A	B	C	D	E
1. Metal Removal 1 (MFGT 111, 8 credits) For beginning Machine Tool Students. Shop Safety, measuring instruments, layout and bench work. Drilling machines, tool room lathes, vertical/horizontal milling machines, introduction to CNC machining and floor grinders.	93%	7%	0%	0%	0%
2. Machinery Handbook Calculations (MFGT 112, 3 credits) The use of the Machinery's Handbook calculations. Tables, charts, and formulas are applied to the needs of the toolmaker such as: ratios, proportions, tapers, levers, screws, pulleys, gear trains, allowances, tolerances, fits, hole circles, and segments. Set up and checking procedures used by the toolmaker. Emphases on algebra, applied geometric principles, and right angle trigonometric functions.	57%	29%	7%	7%	0%

3. Blueprint Reading and Analysis (TDTD 150, 2 credits) For first year manufacturing tooling students. Print layout of information, tolerance block, revision block, do not scale block, notes, bill of material and product detail layout; sketch drawings of simple details from selected shop drawings to include dimensioning, tolerancing, and notes as related to the understanding of reading a part, detail, tool, mold, or die blueprint. Projection, sectioning, and alternative dimensioning; emphasis on shop floor communication.	71%	21%	7%	0%	0%
Winter First Year	**A**	**B**	**C**	**D**	**E**
4. Metal Removal 2 (MFGT 121 , 8 credits) For second semester manufacturing tooling students. More advanced machining operations on the lathe and mill along with basic surface grinding. Thread and taper terminology, measurement, and methods of machining are new topics along with boring, broaching, indexing, rotary table milling, tool post grinding, applying cutting tool materials such as ceramic, carbide tooling and coolants/lubricants.	86%	7%	7%	0%	0%
5. CNC Manual Part Programming (MFGT 122, 4 credits) Manual programming for numerical controlled machinery. Types of CNC controls, machinery, formats, and basic terminology studies. Set-up, tooling, fixturing, and basic program storage methods. Simple part programming includes milling, 3-D contour, and turning. A basic CAD/CAM demo will also be discussed.	79%	7%	7%	7%	0%
Fall Second Year	**A**	**B**	**C**	**D**	**E**
6. Metal Forming Die Construction (MFGT 211, 8 credits) Metal forming die making; use of mill duplicating. CNC electrical discharge machining, tool tryout and rework, and CNC milling. Laboratory projects specialize in metal forming. Diemaking stamping presses, die automation, and electrical sensors; heat treating, whirl-I-gig grinding, surface grinding, and hand grinding.	86%	14%	0%	0%	0%
7. CAD/CAM for CNC Machining (MFGT 212, 4 credits) Fundamentals of programming tool motion on complex surfaces that are created on a 3-D (CAD) based system. Create simple 2-D and 3-D drawings, drive tool motion over the #-D surface, post process the tool data, and edit the output files before sending the program to a machine tool for machining. The basic CMM principles creation of verification of a surface.	79%	14%	0%	7%	0%
8. Introduction to Material Science (MATL 240, 4 credits) Engineering materials: metals, polymers, and ceramics: atomic structure and bonding, properties selection, and testing of materials, failure modes, methods of production and fabrication, methods of changing properties including heat treatment of metals, alloying and surface treatments, mechanical working, composites and compound bonding. Common classification systems used to identify the various engineering materials.	64%	21%	14%	0%	0%
	A	**B**	**C**	**D**	**E**
9. Plastic Mold Construction (MFGT 221, 8 credits) Continuation of previous machine tool training in which mold making, mill duplicating, and pantographing, CNC electrical discharge machining, mold polishing, and the mold try-out machining.	86%	7%	0%	7%	0%

MANUFACTURING TOOLING A.A.S. PROGRAM

General Education:	To a Great Extent A	Somewhat B	Neutral C	Very Little D	Not at All E
10. Scientific Understanding In General, 3 credits)	14%	43%	36%	7%	0%
11. Mathematics: Intermediate Algebra & Numerical Trigonometry (MATH 116, 4 credits) Special factoring forms, exponents, roots and radicals, scientific notation, fractions, first and second degree equations and inequalities, functions and graphs, logarithms, and solutions of logarithmic and exponential equations, systems of equations up to 3x3 and Cramer's Rule, numerical trigonometry including vectors, Law of Sines and Cosines, and graphs of trigonometric functions.	57%	29%	0%	14%	0%
12. Cultural Enrichment (IN GENERAL, 3 credits)	7%	21%	29%	29%	14%
13. Social Awareness (IN GENERAL, 3 credits)	7%	28%	28%	21%	14%

In thinking over your experiences at Ferris State University, to what extent do you feel your education prepared you for success?

MANUFACTURING TOOLING A.A.S. PROGRAM

		To a Great Extent A	Somewhat B	Neutral C	Very Little D	Not at All E
14.	Overall Technical training	71%	29%	0%	0%	0%
15.	Gaining a broad general education about different fields of knowledge	64%	21%	14%	0%	0%
16.	Writing clearly and effectively	29%	58%	14%	0%	0%
17.	Acquiring proficiency with the use of personal computers	46%	46%	8%	0%	0%
18.	Developing values and ethical standards	40%	27%	6%	27%	0%
19.	The ability to think analytically and logically	57%	36%	7%	0%	0%
20.	The ability to learn on your own, pursue ideas, and find information you need	64%	36%	0%	0%	0%
21.	How effectively did the Ferris Manufacturing Tooling Program prepare you for employment?	50%	50%	0%	0%	0%

22. Do you think a four year B.S. Tooling Engineering program at Ferris would be beneficial to industry and our students at Ferris?

A.	Yes	**77%**
B.	No	**8%**
C.	Not sure	**15%**

23. Are you currently a member of the American Society of Manufacturing Engineers?

A.	Yes	**17%**
B.	No	**83%**

24. Do you currently hold a professional certification / registration?

A.	Tool and Die Maker / Through the Department of Labor	**0%**
B.	Society of Manufacturing Engineers, Certified Manufacturing Engineer	**0%**
C.	Professional Engineer	**8%**
D.	Other	**23%**
E.	No	**69%**

25. What is your approximate annual salary?

A.	Less than $40,000	**46%**
B.	$40,000 - 49,000	**39%**
C.	$50,000 - 59,000	**15%**
D.	$60,000 - 69,000	**0%**
E.	More than $69,000	**0%**

26. What industry are you employed in?

A.	Tool and Die construction.	**17%**
B.	Automation equipment manufacturing/application/sales	**25%**
C.	Other/general manufacturing	**58%**
D.	Construction	**0%**
E.	Defense or aerospace	**0%**

27. What is your job title?

A.	Engineer	**42%**
B.	Technician	**0%**
C.	Management	**8%**
D.	Tool Maker / Machinist	**17%**
E.	Other	**33%**

28. Are you currently enrolled in a degree granting program?

A.	Bachelor of Science	**31%**
B.	Master of Science	**0%**
C.	Doctoral	**0%**
D.	No	**69%**

29. Have you received an additional degree(s) since completing the Ferris manufacturing tooling program?

A.	Bachelor of Science	**38%**
B.	Master of Science	**8%**
C.	Doctoral	**0%**
D.	No	**54%**

30. In general, how satisfied were you with your overall experience in the manufacturing tooling program at Ferris State University?

A.	To a great extent	**57%**
B.	Somewhat	**43%**
C.	Neutral	**0%**
D.	Very little	**0%**
E.	Not at all	**0%**

31. Would you recommend the manufacturing tooling program to a friend or relative?

A.	Yes	**100%**
B.	No	**0%**
C.	Not sure	**0%**

32. When you were a Manufacturing Tooling major at Ferris, did you receive a scholarship?

A.	Yes	**29%**
B.	No	**71%**

Your thoughtful responses to the following questions are especially necessary and appreciated.

33. What do you believe was the most valuable part of your coursework? (please write in your response)

34. What do you believe was the least valuable part of your coursework? (please write in your response)

35. What trends in the manufacturing tooling industry do you see impacting the program in the next five years? (please write in your response)

Thank You

Please enclose your answer sheet and this page in the enclosed envelope by May 1, 2003

Manufacturing Tooling Technology – Survey Comments

Question #33 What do you believe was the most valuable part of your coursework?

Alumni

- "All the hands on work. I continued through the engineering program then a MBA and that position has set me apart from the majority of my colleagues."
- "The hands on experiences in the lab."
- "Hands on experience. My favorite instructor was Mr. Gregory. He was very thorough and always cared about the students. He was a valuable instructor in my college career."
- "The professors. Their knowledge and experience combined with the course work was a huge benefit."
- "I think the general experience of working with machines gives us the basis for the rest of the tooling trade. I also liked the CNC training we received because that gives us a step up on someone with no training and we are more receptive to ideas."
- "I believe the most valuable part of the MFGT program was the metal removal courses."
- "Having a good back ground in the machining put me well ahead of the others."
- "The course as a whole was valuable, it opened my eyes to other methods and industries that I would not have been exposed to if I had simply went to work at a shop right out of high school."
- "Planning and scheduling work, Machinery technology."
- "What I appreciated the most was the special attention to detail in my coursework. The very tight tolerances with the heavy workload helped me to gain the skills I have today. I wouldn't be where I am today with out the suffering (in a good way) through the course."
- "Being assigned long duration projects and managing the completion of them to the fullest extent. In industry it is important to finish what you started."
- "Training related directly to my major focus although elective information is very helpful."
- "The faculty was also extremely important, they are extremely personable and have skill in what they teach, they should be complimented!"
- "CNC class"
- "Die Class"

Manufacturing Tooling Technology – Survey Comments

Question #34: What do you believe was the least valuable part of your coursework?

Alumni

- "Cultural and Social Awareness Classes."
- "Cultural Enrichment courses."
- "Dennis Finney's "Soap Box" (just kidding Dennis) Even no so enjoyable aspects played a key roll in the over all picture."
- "I think the related coursework was very beneficial to me but the general education requirements with the exception of math, didn't really matter much to me."
- "For me, the least valuable part of my coursework was the CNC courses. I think that a welding course should be in place co one of the CNC courses. Almost every shop uses a different CNC program, so the only benefit to these courses is the background."
- "The advanced English classes and other non related courses."
- "Social Awareness, these classes should not be required."
- "Some of the elective science courses. Sciences such as physics should be required."
- "Sometimes the lack of software and technology not accessible enough."

Manufacturing Tooling Technology – Survey Comments

Question #35: What trends in the manufacturing tooling industry do you see impacting the program in the next five years?

Alumni

- "Not Sure."
- "Most everything is CNC now."
- "Globalization!!! The international scene is catching up and has caught up in a lot of places. West Michigan's Manufacturing is going to change."
- "I think that the CNC end of machining is going to be the main impact because more and more parts are becoming complex and need the CNC to be able to do it."
- "It seems that there are fewer Manufacturing tooling jobs out there as time goes by. I recall one of my Profs. Boasting about all the past students job offers and how much money they were taking in. Although I have 5500 hours into an apprenticeship, I believe that it will be awhile before I see the $50,000 mark hit. Even though that was the "standard" average annual income for a graduating MFGT Student."
- "You should have a basic welding class, coving arc, wire, and tig welding."
- "Tooling will be increasingly built outside the US. A young person will be very successfully following these tools."
- "Nothing more than expanding on the technology that is already present at Ferris, for example, work up today CNC including CNC lathes and also more detailed mold construction also more emphasis on GDT."
- "AutoCAD or any drawing application and programming."
- "I see a high demand for the program to educate new and existing tooling people."
- "CNC machining needs to be more of an essential."
- "More CNC!"

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology
Employer Survey– Section 3

Manufacturing Tooling Technology Alumni, Employer, Advisory Board Member

Since the 1980's, periodic academic program review has come to be seen as an essential part of curricular and institutional planning in higher education. Programs at Ferris State University with external accrediting agencies have always been required to produce self-study reports periodically. The 1987 North Central Association site visit team mandated that the institution develop a program review process for all academic programs at the University.

The goal of program review is to insure that the academic programs of the University achieve and maintain the highest possible standards of academic excellence. Based on a schedule that spans six years, every academic program will have the opportunity to examine itself using a variety of survey instruments and other measures. The resultant self-study will permit the program, department, college, Division of Academic Affairs, and the University to make informed decisions about curricular issues and resource allocations.

During the 2003/2004 academic year, the Manufacturing Tooling Technology program at Ferris will be reviewed. A vital part of the review process will be your professional input. Enclosed find a survey that we request you complete. Please return the NCS answer sheet and your written responses in the provided envelope by May 1, 2003. The survey should take 15-20 minutes to complete. Individual responses are confidential but the overall responses will be analyzed to help determine the status, trend, and future of the Manufacturing Tooling Technology program at Ferris.

Your participation in this survey is critical in order for us to get an accurate review of our Manufacturing Tooling Technology program. On behalf of the students and faculty of the Manufacturing Tooling Technology program, we thank you for your time and input.

Sincerely,

Manufacturing Tooling Academic Program Review Committee

Encl.

Manufacturing Tooling Technology
Program Content Application Survey

Program Employer Survey

Use the answer sheet provided:

1. If you are an Employer of a Ferris Manufacturing Tooling Technology Graduate (check B). Also, please answer questions 1-22 and 33-35. B

MANUFACTURING TOOLING A.A.S. PROGRAM

Please fill in the appropriate response to the following questions.

To what extent does a graduate require the course knowledge?

III. ***Please circle appropriate rating***

	To a Great Extent	Somewhat	Neutral	Very Little	Not at All
Fall First Year	A	B	C	D	E
1. Metal Removal 1 (MFGT 111, 8 credits) For beginning Machine Tool Students. Shop Safety, measuring instruments, layout and bench work. Drilling machines, tool room lathes, vertical/horizontal milling machines, introduction to CNC machining and floor grinders.	100%	0%	0%	0%	0%
2. Machinery Handbook Calculations (MFGT 112, 3 credits) The use of the Machinery's Handbook calculations. Tables, charts, and formulas are applied to the needs of the toolmaker such as: ratios, proportions, tapers, levers, screws, pulleys, gear trains, allowances, tolerances, fits, hole circles, and segments. Set up and checking procedures used by the toolmaker. Emphases on algebra, applied geometric principles, and right angle trigonometric functions.	67%	33%	0%	0%	0%
3. Blueprint Reading and Analysis (TDTD 150, 2 credits) For first year manufacturing tooling students. Print layout of information, tolerance block, revision block, do not scale block, notes, bill of material and product detail layout; sketch drawings of simple details from selected shop drawings to include dimensioning, tolerancing, and notes as related to the understanding of reading a part, detail, tool, mold, or die blueprint. Projection, sectioning, and alternative dimensioning; emphasis on shop floor communication.	75%	0%	25%	0%	0%

Winter First Year	A	B	C	D	E
4. Metal Removal 2 (MFGT 121 , 8 credits) For second semester manufacturing tooling students. More advanced machining operations on the lathe and mill along with basic surface grinding. Thread and taper terminology, measurement, and methods of machining are new topics along with boring, broaching, indexing, rotary table milling, tool post grinding, applying cutting tool materials such as ceramic, carbide tooling and coolants/lubricants.	75%	25%	0%	0%	0%
5. CNC Manual Part Programming (MFGT 122, 4 credits) Manual programming for numerical controlled machinery. Types of CNC controls, machinery, formats, and basic terminology studies. Set-up, tooling, fixturing, and basic program storage methods. Simple part programming includes milling, 3-D contour, and turning. A basic CAD/CAM demo will also be discussed.	50%	25%	25%	0%	0%
Fall Second Year	A	B	C	D	E
6. Metal Forming Die Construction (MFGT 211, 8 credits) Metal forming die making; use of mill duplicating. CNC electrical discharge machining, tool tryout and rework, and CNC milling. Laboratory projects specialize in metal forming. Diemaking stamping presses, die automation, and electrical sensors; heat treating, whirl-I-gig grinding, surface grinding, and hand grinding.	75%	25%	0%	0%	0%
7. CAD/CAM for CNC Machining (MFGT 212, 4 credits) Fundamentals of programming tool motion on complex surfaces that are created on a 3-D (CAD) based system. Create simple 2-D and 3-D drawings, drive tool motion over the #-D surface, post process the tool data, and edit the output files before sending the program to a machine tool for machining. The basic CMM principles creation of verification of a surface.	50%	25%	25%	0%	0%
8. Introduction to Material Science (MATL 240, 4 credits) Engineering materials: metals, polymers, and ceramics: atomic structure and bonding, properties selection, and testing of materials, failure modes, methods of production and fabrication, methods of changing properties including heat treatment of metals, alloying and surface treatments, mechanical working, composites and compound bonding. Common classification systems used to identify the various engineering materials.	50%	0%	50%	0%	0%
	A	B	C	D	E
9. Plastic Mold Construction (MFGT 221, 8 credits) Continuation of previous machine tool training in which mold making, mill duplicating, and pantographing, CNC electrical discharge machining, mold polishing, and the mold try-out machining.	25%	50%	25%	0%	0%

MANUFACTURING TOOLING A.A.S. PROGRAM

General Education:	To a Great Extent A	Somewhat B	Neutral C	Very Little D	Not at All E
10. Scientific Understanding In General, 3 credits)	50%	0%	50%	0%	0%
11. Mathematics: Intermediate Algebra & Numerical Trigonometry (MATH 116, 4 credits) Special factoring forms, exponents, roots and radicals, scientific notation, fractions, first and second degree equations and inequalities, functions and graphs, logarithms, and solutions of logarithmic and exponential equations, systems of equations up to 3x3 and Cramer's Rule, numerical trigonometry including vectors, Law of Sines and Cosines, and graphs of trigonometric functions.	50%	25%	0%	25%	0%
12. Cultural Enrichment (IN GENERAL, 3 credits)	25%	0%	50%	25%	0%
13. Social Awareness (IN GENERAL, 3 credits)	25%	25%	25%	25%	0%

To what extent do you feel the MFGT program prepares graduates for success?

MANUFACTURING TOOLING A.A.S. PROGRAM

	To a Great Extent A	Somewhat D	Neutral C	Very Little D	Not at All E
14. Overall Technical training	50%	50%	0%	0%	0%
15. Gaining a broad general education about different fields of knowledge	0%	50%	50%	0%	0%
16. Writing clearly and effectively	50%	50%	0%	0%	0%
17. Acquiring proficiency with the use of personal computers	0%	50%	50%	0%	0%
18. Developing values and ethical standards	50%	0%	50%	0%	0%
19. The ability to think analytically and logically	50%	0%	50%	0%	0%
20. The ability to learn on your own, pursue ideas, and find information you need	50%	0%	50%	0%	0%
21. How effectively does the Ferris Manufacturing Tooling program prepare graduates for Employment?	100%	0%	0%	0%	0%

22. **Do you think a four year B.S. Tooling Engineering program at Ferris would be beneficial to industry and our students at Ferris?**

A. Yes **50%**
B. No **50%**
C. Not sure

Thank You

Please enclose your answer sheet and this page in the enclosed envelope by May 1, 200

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Student Evaluation of Program – Section 4

Program: ***Manufacturing Tooling Technology***

Program Student Survey

Instructions: Circle the number that most closely represents your perception of the Manufacturing Tooling curriculum.

1. Faculty Mastery of Subject Matter

5	4	3	2	1

Extremely high — Below average

2. Organization of Courses

5	**4**	3	2	1

Very organized — Not organized

3. Faculty Concern for Students

5	**4**	3	2	1

Very high — Very low

4. Faculty Impartiality on grades and exams

5	**4**	3	2	1

5. Use of Profession/Industry Standards

5	**4**	3	2	1

Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses — little or no recognition is given to specific profession/ industry standards in planning and evaluating this program

6. Relevance of Supportive Courses (Non MFGT Courses)

5	**4**	3	2	1

Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students

Supportive course content reflects no planned approach to meeting needs of students in this program

7. Instructional Staffing (Faculty)

5	**4**	3	2	1

Instructional staffing for this program is sufficient to permit optimum program effectiveness

Staffing is inadequate to to meet the needs of this program effectively

8. Facilities

5	4	3	2	1

Present facilities are sufficient to support a high quality program

Present facilities are a major problem for program quality

9. Scheduling of Instructional Facilities

5	**4**	**3**	2	1

Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction

Facilities and equipment for this program are significantly under-or-over schedule

10. Equipment

5	**4**	3	2	1

Present equipment is sufficient to support a high quality program

Present equipment is not adequate and represents a threat to program quality

11. Availability of Instructors

5	4	3	2	1

Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as: small group or individualized instruction, laboratory or "hands on" experiences, credit by examination)

Instructional approaches in this program do not consider individual student differences.

12. Adequate and Availability of Instructional Materials and Supplies

5	**4**	3	2	1

Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs

13. Overall quality of instructors

5	4	3	2	1

Rate instructor as extremely high

Rate the instructor as below average

14. Satisfaction with Program

5	4	3	2	1

Very satisfied with the program faculty, equipment, and curriculum

Not satisfied with the program faculty, equipment, and curriculum

15. Student Perceptions of Program

5	**4**	3	2	1

Students perceive the program curriculum, facilities and equipment to be of the highest quality

Students perceive the program curriculum, facilities and equipment needs improvement

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Faculty Perception of Program – Section 5

Program: ***Manufacturing Tooling Technology***

Faculty Perception of Program

Instructions: Check the block which most closely describes the program you are evaluating.

Faculty Perceptions of the Manufacturing Tooling Technology Program

MY PROGRAM AREA IS: _____ Manufacturing Tooling

	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5	Unknown U
1. The FSU MFGT program is consistent with the FSU Mission Statement	83%	17%				
2. The FSU MFGT program is consistent with the objectives and goals of the FSU College of Technology	83%	17%				
3. The FSU MFGT faculty supports the MFGT program.	67%	33%				
4. FSU administration supports the FSU MFGT program.		100%				
5. The cost of administering the FSU MFGT program is inexpensive compared to other FSU technology associate degree programs.		50%	33%			17%
6. The MFGT current equipment is sufficient to support a high quality program.	17%	56%	17%			
7. The present facilities assigned to the MFGT program are sufficient to support a high quality program.		67%	17%	17%		
8. The currently enrolled MFGT students highly rate instructional effectiveness.	17%	67%	17%			

9. The currently enrolled MFGT students are very satisfied with the program, faculty, equipment & curriculum.	17%	67%	17%			
10. The graduates of the MFGT program easily find employment in their chosen field.	67%	33%				
11. The starting salary of the MFGT program's graduates is comparable to other College of Technology A.A.S. degrees.	67%	17%	17%			
12. The employers of MFGT graduates rate the quality of the program graduate's performance as high when compared to similar degrees from other institutions.	83%	17%				
13. The students in Bachelor Degree programs that ladder from the 2 year MFGT program highly rate the MFGT program.	50%	50%				
14. The academic reputation of the MFGT courses counting towards COT degrees is sound.	67%	33%				
15. MFGT Faculty Development is supported financially by the FSU administration.		83%	17%			
16. The MFGT program needs to expand the options available to recruit potential students to maintain enrollment and satisfy employer demand for graduates.	50%	50%				
2 17. The FSU MFGT A.A.S. is a quality degree comparable to other associate degrees from similar institutions.	83%	17%				
18. The equipment and facilities are adequate to provide an applicable, and high quality instruction to related technology students who enroll in MFGT courses required for their major.	33%	33%	33%			

College of Technology
Manufacturing Tooling Technology

Advisory Committee Perceptions of Program Survey – Section 6

Manufacturing Tooling Technology
Program Content Application Survey

Advisory Survey

Use the answer sheet provided:

1. Advisory Board Members, please answer questions 1-22 and 33-35.

MANUFACTURING TOOLING A.A.S. PROGRAM

Please fill in the appropriate response to the following questions.

To what extent does a graduate require the course knowledge?

IV. ***Please circle appropriate rating***

	To a Great Extent	Somewhat	Neutral	Very Little	Not at All
Fall First Year					
1. Metal Removal 1 (MFGT 111, 8 credits) For beginning Machine Tool Students. Shop Safety, measuring instruments, layout and bench work. Drilling machines, tool room lathes, vertical/horizontal milling machines, introduction to CNC machining and floor grinders.	**A**	B	C	D	E
2. Machinery Handbook Calculations (MFGT 112, 3 credits) The use of the Machinery's Handbook calculations. Tables, charts, and formulas are applied to the needs of the toolmaker such as: ratios, proportions, tapers, levers, screws, pulleys, gear trains, allowances, tolerances, fits, hole circles, and segments. Set up and checking procedures used by the toolmaker. Emphases on algebra, applied geometric principles, and right Angle trigonometric functions.	**A**	**B**	C	D	E

3. Blueprint Reading and Analysis (TDTD 150, 2 credits) For first year manufacturing tooling students. Print layout of information, tolerance block, revision block, do not scale block, notes, bill of material and product detail layout; sketch drawings of simple details from selected shop drawings to include dimensioning, tolerancing, and notes as related to the understanding of reading a part, detail, tool, mold, or die blueprint. Projection, sectioning, and alternative dimensioning; emphasis on shop floor communication.	**A**	B	C	D	E
Winter First Year					
4. Metal Removal 2 (MFGT 121 , 8 credits) For second semester manufacturing tooling students. More advanced machining operations on the lathe and mill along with basic surface grinding. Thread and taper terminology, measurement, and methods of machining are new topics along with boring, broaching, indexing, rotary table milling, tool post grinding, applying cutting tool materials such as ceramic, carbide tooling and coolants/lubricants.	**A**	B	C	D	E
5. CNC Manual Part Programming (MFGT 122, 4 credits) Manual programming for numerical controlled machinery. Types of CNC controls, machinery, formats, and basic terminology studies. Set-up, tooling, fixturing, and basic program storage methods. Simple part programming includes milling, 3-D contour, and turning. A basic CAD/CAM demo will also be discussed.	A	**B**	C	D	E
Fall Second Year					
6. Metal Forming Die Construction (MFGT 211, 8 credits) Metal forming die making; use of mill duplicating. CNC electrical discharge machining, tool tryout and rework, and CNC milling. Laboratory projects specialize in metal forming. Diemaking stamping presses, die automation, and electrical sensors; heat treating, whirl-I-gig grinding, surface grinding, and hand grinding.	**A**	B	C	D	E
7. CAD/CAM for CNC Machining (MFGT 212, 4 credits) Fundamentals of programming tool motion on complex surfaces that are created on a 3-D (CAD) based system. Create simple 2-D and 3-D drawings, drive tool motion over the #-D surface, post process the tool data, and edit the output files before sending the program to a machine tool for machining. The basic CMM principles creation of verification of a surface.	A	**B**	C	D	E
8. Introduction to Material Science (MATL 240, 4 credits) Engineering materials: metals, polymers, and ceramics: atomic structure and bonding, properties selection, and testing of materials, failure modes, methods of production and fabrication, methods of changing properties including heat treatment of metals, alloying and surface treatments, mechanical working, composites and compound bonding. Common classification systems used to identify the various Engineering materials.	**A**	B	C	D	

9. Plastic Mold Construction (MFGT 221, 8 credits) Continuation of previous machine tool training in which mold making, mill duplicating, and pantographing, CNC electrical discharge machining, mold polishing, and the mold try-out machining.	A	B	**C**	D	E

MANUFACTURING TOOLING A.A.S. PROGRAM

General Education:	To a Great Extent	Somewhat	Neutral	Very Little	Not at All
10. Scientific Understanding In General, 3 credits)	**A**	B	C	D	E
11. Mathematics: Intermediate Algebra & Numerical Trigonometry (MATH 116, 4 credits) Special factoring forms, exponents, roots and radicals, scientific notation, fractions, first and second degree equations and inequalities, functions and graphs, logarithms, and solutions of logarithmic and exponential equations, systems of equations up to 3x3 and Cramer's Rule, numerical trigonometry including vectors, Law of Sines and Cosines, and graphs of trigonometric functions.	**A**	B	C	D	E
12. Cultural Enrichment (IN GENERAL, 3 credits)	A	**B**	C	D	E
13. Social Awareness (IN GENERAL, 3 credits)	A	**B**	C	D	E

To what extent do you feel the MFGT program prepares graduates for success?

MANUFACTURING TOOLING A.A.S. PROGRAM

		To a Great Extent	Somewhat	Neutral	Very Little	Not at All
14.	Overall Technical training	**A**	B	C	D	E
15.	Gaining a broad general education about different fields of knowledge	A	**B**	C	D	E
16.	Writing clearly and effectively	**A**	B	C	D	E
17.	Acquiring proficiency with the use of personal computers	A	**B**	C	D	E
18.	Developing values and ethical standards	**A**	B	C	D	E
19.	The ability to think analytically and logically	**A**	B	C	D	E
20.	The ability to learn on your own, pursue ideas, and find information you need	**A**	B	C	D	E

21. How effectively did the Ferris Manufacturing Tooling program(s) prepare you for employment?	A	B	C	D	E

22. **Do you think a four year B.S. Tooling Engineering program at Ferris would be beneficial to industry and our students at Ferris?**

A. Yes **100%**
B. No **0%**
C. Not sure **0%**

Thank You

Please enclose your answer sheet and this page in the enclosed envelope by March 13, 1998

July 29, 2004

Dear Gary:

The rebirth of manufacturing in North America has begun. "Outsourcing" is about to be replaced with "insourcing," as North American manufacturing makes its biggest comeback in 25 years. To be one of the companies that will benefit from this influx of business, it is imperative that you know how to equip your operation with the latest machinery and technology.

As chairman of the board of AMT – The Association For Manufacturing Technology and president of Wes-Tech, I have witnessed a dramatic increase in the demand for goods and equipment manufactured in North America over the last 12 months. This is not a fluke, rather a significant, sustained and measurable upswing supported by industry statistics that is likely to continue for years to come.

Why? Because the technologically advanced equipment now available is rendering low overseas labor costs irrelevant due to exponential increases in productivity and efficiency. Rising worldwide energy costs, skyrocketing shipping fees, and upcoming adjustments in currency markets are creating a manufacturing climate that no longer consistently favors production outsourcing.

Attending this year's International Manufacturing Technology Show (IMTS) is a must if your business is going to benefit from this manufacturing resurgence. **I am so convinced that you should be at IMTS that I have authorized AMT to extend the early registration discount for you through August 20, 2004.** Here's how to take advantage of this special offer: Go to http://ww7.expocard.com/shows/imt041/special to register, or complete and mail or fax back the enclosed special registration form.

Sincerely,

Robert Weskamp
President, Wes-Tech
Chairman of the Board, AMT – The Association For Manufacturing Technology

P.S. **Our discounted $20 registration fee is only good until August 20, 2004.** Don't delay. Register now at http://ww7.expocard.com/shows/imt041/special, or fill out the enclosed form and fax it to 301-694-5124 or return by mail.

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Labor Market Analysis – Section 7

Bureau of Labor Statistics, U.S. Department of Labor

EMPLOYMENT – COMPUTER NUMERICALLY CONTROLLED (CNC)

Computer-control programmers and operators held about 151,000 jobs in 2002, mostly working in machine shops, plastics products manufacturing, or machinery manufacturing. Although computer-control programmers and operators work in all parts of the country, jobs are most plentiful in the areas where manufacturing is concentrated.

NATURE OF THE WORK - CNC

Computer-control programmers and operators use computer numerically controlled (CNC) machines to cut and shape precision products, such as automobile parts, machine parts, and compressors. CNC machines include machining tools such as lathes, multiaxis spindles, milling machines, and electrical discharge machines (EDM), but the functions formerly performed by human operators are performed by a computer-control module. CNC machines cut away material from a solid block of metal, plastic, or glass—known as a workpiece—to form a finished part. Computer-control programmers and operators normally produce large quantities of one part, although they may produce small batches or one-of-a-kind items. They use their knowledge of the working properties of metals and their skill with CNC programming to design and carry out the operations needed to make machined products that meet precise specifications.

Before CNC programmers—also referred to as numerical tool and process control programmers—machine a part, they must carefully plan and prepare the operation. First, these workers review three-dimensional computer aided/automated design (CAD) blueprints of the part. Next, they calculate where to cut or bore into the workpiece, how fast to feed the metal into the machine, and how much metal to remove. They then select tools and materials for the job and plan the sequence of cutting and finishing operations.

Next, CNC programmers turn the planned machining operations into a set of instructions. These instructions are translated into a computer aided/automated manufacturing (CAM) program containing a set of commands for the machine to follow. These commands normally are a series of numbers (hence, numerical control) that describes where cuts should occur, what type of cut should be used, and the speed of the cut. CNC programmers and operators check new programs to ensure that the machinery will function properly and that the output will meet specifications. Because a problem with the program could damage costly machinery and cutting tools, computer simulations may be used to check the program instead of a trial run. If errors are found, the program must be changed and retested until the problem is resolved. In addition, growing connectivity between CAD/CAM software and CNC machine tools is raising productivity by automatically translating designs into instructions for the computer controller on the

machine tool. These new CAM technologies enable programs to be easily modified for use on other jobs with similar specifications.

After the programming work is completed, CNC operators—also referred to as computer-controlled machine tool operators, metal and plastic—perform the necessary machining operations. The CNC operators transfer the commands from the server to the CNC control module using a computer network link or floppy disk. Many advanced control modules are conversational, meaning that they ask the operator a series of questions about the nature of the task. CNC operators position the metal stock on the CNC machine tool—spindle, lathe, milling machine, or other—set the controls, and let the computer make the cuts. Heavier objects may be loaded with the assistance of other workers, autoloaders, a crane, or a forklift. During the machining process, computer-control operators constantly monitor the readouts from the CNC control module, checking to see if any problems exist. Machine tools have unique characteristics, which can be problematic. During a machining operation, the operator modifies the cutting program to account for any problems encountered. Unique, modified CNC programs are saved for every different machine that performs a task.

CNC operators detect some problems by listening for specific sounds—for example, a dull cutting tool or excessive vibration. Dull cutting tools are removed and replaced. Machine tools rotate at high speeds, which can create problems with harmonic vibrations in the workpiece. Vibrations cause the machine tools to make minor cutting errors, hurting the quality of the product. Operators listen for vibrations and then adjust the cutting speed to compensate. In older, slower machine tools, the cutting speed would be reduced to eliminate the vibrations, but the amount of time needed to finish the product would increase as a result. In newer, high-speed CNC machines, increasing the cutting speed normally eliminates the vibrations and reduces production time. CNC operators also ensure that the workpiece is being properly lubricated and cooled, because the machining of metal products generates a significant amount of heat.

WORKING CONDITIONS - CNC

Most machine shops are clean, well lit, and ventilated. Most modern CNC machines are partially or totally enclosed, minimizing the exposure of workers to noise, debris, and the lubricants used to cool workpieces during machining. Nevertheless, working around high-speed machine tools presents certain dangers, and workers must follow safety precautions. Computer-controlled machine tool operators, metal and plastic, wear protective equipment, such as safety glasses to shield against bits of flying metal and earplugs to dampen machinery noise. They also must exercise caution when handling hazardous coolants and lubricants. The job requires stamina because operators stand most of the day and, at times, may need to lift moderately heavy workpieces.

Numerical tool and process control programmers work on desktop computers in offices that typically are near, but separate from, the shop floor. These work areas usually are clean, well lit, and free of machine noise. Numerical tool and process control programmers occasionally need to enter the shop floor to monitor CNC machining operations. On the shop floor, CNC programmers encounter the same hazards and exercise the same safety precautions as do CNC operators.

Most computer-control programmers and operators work a 40-hour week. CNC operators increasingly work evening and weekend shifts as companies justify investments in more expensive machinery by extending hours of operation. Overtime is common during peak production periods.

JOB OUTLOOK - CNC

Computer-control programmers and operators should have excellent job opportunities. Due to the limited number of people entering training programs, employers are expected to continue to have difficulty finding workers with the necessary skills and knowledge. Employment of computer-controlled machine tool operators is projected to grow more slowly than the average for all occupations through 2012, but employment of numerical tool and process control programmers is expected to grow about as fast as the average for all occupations through 2012. Job growth in both occupations will be driven by the increasing use of CNC machine tools. Advances in CNC machine tools and manufacturing technology will further automate production, boosting CNC operator productivity and limiting employment growth. The demand for computer-control programmers will be negatively affected by the increasing use of software that automatically translates part and product designs into CNC machine tool instructions.

EARNINGS - CNC

Median hourly earnings of computer-controlled machine tool operators, metal and plastic, were $13.97 in 2002. The middle 50 percent earned between $11.07 and $17.43. The lowest 10 percent earned less than $9.14, whereas the top 10 percent earned more than $21.27. Median hourly earnings in the manufacturing industries employing the largest numbers of computer-controlled machine tool operators, metal and plastic, in 2002 were:

Metalworking machinery manufacturing	$15.97
Other fabricated metal product manufacturing	15.14
Machine shops; turned product; and screw, nut, and bolt manufacturing	13.82
Motor vehicle parts manufacturing	13.08
Plastics product manufacturing	11.00

Median hourly earnings of numerical tool and process control programmers were $18.04 in 2002. The middle 50 percent earned between $14.52 and $22.23. The lowest 10 percent earned less than $11.53, while the top 10 percent earned more than $27.37.

Suggested citation: Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2004-05 Edition*, Tool and Die Makers, on the Internet at **http://www.bls.gov/oco/ocos225.htm** (visited June 02, 2004).

Bureau of Labor Statistics, U.S. Department of Labor

EMPLOYMENT - TOOL AND DIE MAKERS

Tooling Technologist/Tool and die makers held about 109,000 jobs in 2002. Most worked in industries that manufacture metalworking machinery, transportation equipment (such as motor vehicle parts and aerospace products), and fabricated metal products, as well as plastics product manufacturing. Although they are found throughout the country, jobs are most plentiful in the Midwest, Northeast, and West, where many of the metalworking industries are located.

NATURE OF THE WORK - TOOL AND DIE MAKERS

Tooling Technologist/Tool and Die Makers are highly skilled workers who produce tools, dies, and special guiding and holding devices that are used in machines that produce a variety of products from clothing and furniture to heavy equipment and parts for aircraft.

Tooling Technologist/Toolmakers develop, process and manufacture precision tools which are used to cut, shape, and form metal and other materials. They also produce jigs and fixtures (devices that hold metal while it is bored, stamped, or drilled) and gauges and other measuring devices. Diemakers construct metal forms (dies) that are used to shape metal in stamping and forging operations. They also make metal molds for diecasting and for molding plastics, ceramics, and composite materials. In addition, tool and die makers may repair worn or damaged tools, dies, gauges, jigs, and fixtures, and design tools and dies.

Tooling Technologist / Toolmakers are a much broader knowledge of manufacturing operations, mathematics, and interpreting engineering drawings in order to process and manufacture components for tooling operations. The Tooling Technologist use many types of machine tools and precision metrology instruments, and must be familiar with the manufacturing operations and properties, such as hardness and heat tolerance, of a wide variety of common metals and alloys.

Working from engineering drawings or instructions, the tooling technologist can identify the operations necessary to manufacture individual and multiple components. They define the metal that will be cut to form parts of the final product. They then cut, bore, or drill the part as required. They also check the accuracy of what they have done to ensure that the final product will meet specifications. Then they assemble the parts and perform finishing jobs such as filing, grinding, and smoothing surfaces.

Modern technology is helping to change tool and die makers' jobs. Firms commonly use computer aided design (CAD) to develop products. Specifications from the computer program can then be used to develop designs electronically for the required tools and dies. The designs can then be sent to computer numerically controlled (CNC) machines to

produce the die. Programs can also be electronically stored and adapted for future use. This saves time and increases productivity of the workers.

In shops that use numerically controlled (NC) machine tools, tool and die makers duties may be slightly different. For example, although they still manually check and assemble the tool or die, each of its components may be produced on an NC machine. In addition, they often assist in the planning and writing of NC programs.

WORKING CONDITIONS - TOOL AND DIE MAKERS

Tool and die makers usually work in a manufacturing tooling facilities. These areas are quieter than the production floor because there are fewer machines in use at one time. Machines have guards and shields that minimize the exposure of workers to moving parts. Tool and die makers, however, must follow safety rules and wear protective equipment, such as safety glasses to shield against bits of flying metal and earplugs to prevent against noise. They also may be exposed to hazardous lubricants and cleaners. In addition, they spend much of the day on their feet and may do moderately heavy lifting.

Companies employing tool and die makers traditionally operate one shift per day. However, as the cost of new machinery and technology has increased, many employers now have more than one shift. Overtime and Saturday work are common, especially during peak production periods.

JOB OUTLOOK - TOOL AND DIE MAKERS

Applicants with the appropriate skills and background should enjoy excellent opportunities for tool and die maker jobs. The number of workers receiving training in this occupation is expected to continue to be fewer than the number of openings created each year by tool and die makers who retire or transfer to other occupations. As more of these highly skilled workers retire, employers in certain parts of the country report difficulty attracting well-trained applicants. A major factor limiting the number of people entering the occupation is that many young people who have the educational and personal qualifications necessary to learn tool and die making may prefer to attend college or may not wish to enter production-related occupations.

Despite expected excellent employment opportunities, little or no growth in employment of tool and die makers is projected over the 2002-12 period because advancements in automation, including CNC machine tools and computer-aided design, should improve worker productivity, thus limiting employment. On the other hand, tool and die makers play a key role in building and maintaining advanced automated manufacturing equipment. As firms invest in new equipment, modify production techniques, and implement product design changes more rapidly, they will continue to rely heavily on skilled tool and die makers for retooling.

TO: Jack Buss, Chair, Academic Program Review Committee

FROM: Gary Ovans, Chair, Manufacturing Department

SUBJECT: Program Review Panel, Manufacturing Engineering Technology

Date: 1-5-04

The following is a list of individuals comprising the PRP for Manufacturing Engineering Technology, B.S. Program.

Panel Chair:	Blaine Danley, Assistant Professor, MFGE
Dept. Chair:	Gary Ovans, Professor, MFGE
Program Faculty:	Jim Rumpf, Associate Professor, MFGE Bruce Gregory, Professor, MFGE
Individual/Special Interest:	Greg Key, Professor, AUTO
Faculty Member/ Outside College:	Tom Brownell, Professor, Languages and Literature
Industry Representative:	TBD

TO: Jack Buss, Chair, Academic Program Review Committee

FROM: Gary Ovans, Chair Manufacturing Dept.
Blaine Danley, Assistant Professor, Manufacturing Engineering Technology

SUBJECT: Proposed budget for Manufacturing Engineering Technology program review panel

DATE: 1-5-04

Below is a copy of our proposed budget for the Manufacturing Engineering Technology review panel. Please contact us if you have any questions.

Student Surveys (525)

Copying Costs	*$52.50*
Return Envelope Printing	*$37.00*

Advisory Board Surveys

Copying	*$10.00*

Phone Expenses	*$75.00*

Final Document Copying Costs

Binders + Copies	*$355*
TOTAL	***$529.50***

MFGE Response to Questions for B.S. in Manufacturing Engineering Technology Program Review Panel Fall 2004

The following questions or requests for information are the result of our discussion concerning specific statements or material within the B.S. in Manufacturing Engineering Technology Program Review Panel document. The page number containing the material upon which the question is based is cited prior to the question.

1- **The Administrative Program Review indicates an enrollment in Grand Rapids that exceeds the enrollment on the Big Rapids campus. What is the capacity in GR? What is the capacity in individual courses taught in Grand Rapids? How long would it take a typical student to complete this program attending only classes in Grand Rapids?**

response

Program capacity is not limited because students only take classes as time allows. Course capacity is typically 16 in laboratory, and 32 in lecture, but often capped below these levels due to room size constraints. It typically requires 4-6 years to complete the program.

1-3 **Please elaborate on the inequities that exist at the ATC. Are there adequate laboratory facilities at the ATC? In view of the enrollment differential, is it feasible to center this program in GR rather than Big Rapids? If not, why not?**

response

MFGE faculty feel that the laboratory facilities available at the ATC are as good, or better, than facilities available at the Big Rapids campus.

The MFGE faculty does not think that it would be beneficial to "center this program in GR". The Big Rapids campus targets full-time students while the ATC is targeted at working professionals taking courses part-time in the evenings. This difference should be factored in when comparing student enrollment between campuses. Also the majority of the MFGE workload is at the Big Rapids campus, with both core MFGE courses and related courses for other degree programs.

1-3 **Who teaches off campus courses? What % of the Big Rapids faculty is involved in teaching these courses?**

response

All MFGE faculty are required to teach courses at both locations; however assignments are made based upon course specialty, faculty expertise, and workload.

1-8 Mention is made in the Administrative Program Review with respect to the SME certification exam pass rates. Are these percentages of pass rate considered good? How do these pass rates compare with those of competitors?

response

Pass rates are considered very high by SME standards, however, results from other schools are now considered proprietary. Previous years comparisons have indicated that FSU students have preformed better than Purdue students, as an example. Pass rates range from 39% to 57.9% over the last 7 years.

2-1 Why did the panel choose to use the FSU data from the 2001/2002 graduate survey instead of conducting its own survey? Did this survey provide the program with the information that was needed to assess the quality of the program?

response

Yes, this survey does provide the program with the information needed and it is from an unbiased source that all observers are familiar with.

3-1 How many employer surveys were mailed out? How many were returned?

response

The 15 companies listed on page 3-1 were personally visited. We felt lucky to get 5 minutes with these people. We will remind the Council that people in industry are very busy and it is very difficult to get them to take time to answer surveys.

4-1 How many surveys were distributed to 3rd year students? 4th year students? How many were returned from each class

response

- 14 surveys to 3rd year students – 100% returned
- 9 surveys to 4th year students – 100% returned
- 23 surveys to GR students – 100% returned

5-1 How many Faculty Perception surveys were mailed out? How many were returned? Please supply the number of responses to each of the questions on the survey form.

response

16 surveys were sent out to non-MFGE faculty, 4 were returned. 6 surveys were sent out to MFGE faculty and all were returned. Responses to each question are provided on the survey form at the end of this document.

6-1 How many Industry Advisory Board Perception surveys were mailed out? How many were returned? Would you please supply the number of responses to each of the questions on the survey form?

response

23 surveys were sent out, 12 were returned. Responses to each question are provided on the survey form in section 6 of the report.

8-5 The summary states that the "facilities and equipment do not meet either the pedagogical or aesthetic needs of the program." That statement does not seem to be supported in the evaluations. Is it appropriate to continue a program that is pedagogically inadequate?

response

Respondents do not appreciate the ability of faculty to work around facility limitations and provide a meaningful learning experience. The program is not "pedagogically inadequate", the resources available to deliver it are. The MFGE faculty are trying to express that we can not advance the program beyond its current position without adequate facilities.

10-2 The on-campus enrollment has continued to drop and last year was the smallest it has been in 10years. What do you anticipate the on-campus enrollment in this program will be in 2 years? 5 years?

response

The goal is to have 25 students entering the program each year. Marketing/recruiting efforts by faculty are being enhanced to meet this goal. Factors such as media reports on the loss of manufacturing jobs in the U.S. and internal FSU competition for students have affected MFGE enrollment numbers. The loss of manufacturing jobs in the U.S. has occurred in the hourly positions not the technical positions our students fill; however, this negative press is often not understood by potential students

10-2 Please clarify the distinction between the Manufacturing Engineering Technology Degree and the Quality Engineering Technology degrees

response

Table 1: Summary of Common and Unique Classes; MFGE vs. QUET

Manufacturing Only Courses	Common Courses	Quality Only Courses
MFGE 311 Industrial Engineering	MECH 340 Statics and Strength of Material	MATL 341 Materials Selection Metals
MFGE 312 CNC & CAM	MFGE 321 Metrology	MFGE 443 Continuous Improvement
MFGE 313 Computer Applications	MFGE 322 Production Processes	MFGE 444 Quality Auditing
MFGE 326 Process Tolerance Design	MFGE 324 Tool Engineering	MFGE 445 Reliability Engineering
MFGE 411 Principles of Process Planning	MFGE 341 Quality Science Statistics	MFGE 446 Design of Experiments 2
MFGE 421 Automation and System Design	MFGE 342 Statistical Process Engineering	STQM 311 Continuous Improvement Tools
MFGE 422 Facilities Planning	MFGE 393 Internship	MFMT 302 Organizational Behavior
PDET 322 Model and Prototype Development	MFGE 423 Engineering Economics	
PLTS 325 Plastics Processing	MFGE 442 Design of Experiments	
WELD 416 Production Welding Processes		
27 Total Credits	28 Total Credits	21 Total Credits

These differences in class requirements reflect the differences found on-the-job for the professional Manufacturing Engineer and Quality Engineer. The typical Manufacturing Engineer focuses on improving the operations (examples include plant throughput rate, efficiency of particular operations, and developing new processes for new parts), without compromising the quality of the parts. The typical Quality Engineer focuses on improving the quality of parts, without compromising throughput rate, and other Manufacturing Engineering issues.

The Manufacturing Engineer graduates with a strong background in manufacturing processes. Machining as a process is learned in MFGE 312, MFGE 324, and reinforced in MFGE 411. Students are also exposed to other typical manufacturing processes during MFGE 322, PLTS 325 and WELD 326. Fundamental tools of process analysis, applicable to any and all processes, are taught in MFGE 311, MFGE 326. The macroscopic tools are taught in MFGE 421 and MFGE 422.

Quality Engineers spend more of their educational time taking statistically based classes. These important tools for analysis are applied to all types of processes, and prepare the student to interact with customers and to discuss the issues typical to manufacturing. If statistics is the language of variation, then the Quality Engineering students are well prepared to "speak" to the manufacturing processes.

The common core of classes insures that all the students have the basic tools to understand the more advanced topics they will face, as well as communicate with other disciplines to solve problems and improve efficiencies throughout a shop environment.

12-2 At what sites other than GR are program courses taught? Are students in these courses included in the off campus numbers?

response

Muskegon CC, Delta CC, Henry Ford CC, St. Clair CC, Lansing CC, Macomb CC. These are a result of UCEL offering their BAS/BIS at off-campus sites.

12-3 Your program provides a number of courses that service a variety of non-majors. Has this adversely affected students in your program?

response

No, we feel this is one of the benefits to the students in our program. It gives our students the opportunity to work with students with different perspectives. However, it does cause increased workloads for faculty which often leads to overloads.

13-2 Please clarify your concerns with respect to faculty development and obtaining an advanced degree. Is there a problem with the degree program offered by WMU program for faculty for administration from Ferris?

response

This concern is related to the desire of faculty to earn a PhD. Faculty would like to see assistance from the administration in the specific area of advanced degrees related to Manufacturing Engineering. The WMU program is one of many programs available to faculty, but this is not specific to our field or "supported" by administration.

Administration support to attend workshops, seminars, and professional conferences has been excellent in recent years.

13-3 In view of the deficiencies in facilities cited in this report, is it currently
13-5 feasible to develop an AAS degree? What other obstacles have prevented this from happening?

Response

Yes, an AAS and a 0-4 degree could be developed using existing courses within FSU. This needs further discussion and review.

13-3 How soon do you anticipate going for ABET accreditation? What obstacles do you face? What benefits do you anticipate gaining by achieving accreditation?

response

No date has been set to achieve ABET accreditation. The MFGE advisory board has recommended that the program not make major curriculum changes to achieve ABET accreditation. The MFGE faculty would like to achieve accreditation; however, the necessary money and time are not currently available. Once an AAS degree or 0-4 degree is developed it will provide an opportunity to achieve accreditation.

13-3 What is your rationale for wishing to offer a MS degree? Do you have faculty with the academic credentials to offer the degree? Have you done a labor market analysis do determine the market for graduates of such a degree?

response

The rationale for offering an MS degree is driven by interest from alumni of the program. To date no market analysis has been performed and this issue is considered a "back burner" item by the MFGE faculty.

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	33%	67%				
2. The FSU MFGE program is consistent with the objectives and goals of the FSU College of Technology	33%	67%				
3. The FSU MFGE faculty support the MFGE program.	50%	50%				
4. FSU administration supports the FSU MFGE program.			33%	33%	33%	
5. The cost of administering the FSU MFGE program is inexpensive compared to other FSU technology baccalaureate programs		17%	67%	17%		
6. The MFGE current equipment is sufficient to support a high quality program.				33%	67%	
7. The present facilities assigned to the MFGE program are sufficient to support a high quality program.				33%	67%	
8. The currently enrolled MFGE students rate instructional effectiveness as high.	33%	67%				
9. The currently enrolled MFGE students are very satisfied with the program, faculty, equipment & curriculum.		33%	50%	17%		

MFGE response to Questions for B.S. in Manufacturing Engineering Technology Review Panel – Fall 2004

	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.		100%				
11. The starting salary of the MFGE program's graduates is comparable to other College of Technology B.S. degrees.	100%					
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.		100%				
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.		50%	50%			
14. The number of tracks or options in the MFGE program should be increased whenever possible.		50%	50%			
15. The academic reputation of the MFGE courses counting towards COT degrees is sound.	33%	67%				
16. The academic reputation of the MATL courses counting towards COT degrees is sound.		100%				
17. The FSU MFGE B.S. is a quality degree comparable to other baccalaureate degrees in similar institutions.		100%				
18.The equipment and facilities are adequate to provide highest quality supporting classes to related technology students who enroll in MFGE courses				50%	50%	

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.				50%	50%	
20. The MFGE program needs to expand the options available to recruit potential students to maintain enrollment and satisfy employer demand for graduates	50%	50%				
21. MFGE Faculty Development is supported financially by the FSU administration.		33%	50%	17%		

Faculty Comments:

MFGE response to Questions for B.S. in Manufacturing Engineering Technology Review Panel – Fall 2004

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

	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.		50%	50%			
2. The FSU MFGE program is consistent with the objectives and goals of the FSU College of Technology.		50%	50%			
3. FSU administration supports the FSU MFGE program.		25%	50%	25%		
4. The cost of administering the FSU MFGE program is inexpensive compared to other FSU technology baccalaureate programs.	25%	25%	50%			
5. The MFGE current equipment is sufficient to support a high quality program.			25%	50%	25%	
6. The present facilities assigned to the MFGE program are sufficient to support a high quality program.		25%		75%		
7. The +2 MFGE degree is a quality degree that adds significant value to your AAS degree graduates.	50%	25%	25%			
8. The +2 MFGE degree is comparable to other BS options for your AAS degree graduates.		75%	25%			
9. Students from your AAS degree can easily articulate to the +2 MFGE BS degree.	25%	75%				
10. The curriculum content of the +2 MFGE degree correlates with the expectations of your Advisory Board for additional coursework beyond your AAS degree.		25%	25%			50%

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.	25%	25%	25%	25%		
2. The instructional facilities and equipment of the MATL coursework meet your program objectives and student needs.	25%	25%		50%		
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.		25%	25%	25%	25%	
4. Currently enrolled students in your program rate the MFGE instructional effectiveness as extremely high.		25%	50%		25%	
5. Currently enrolled students in your program rate the MATL instructional effectiveness as extremely high.		75%				25%
6. The curriculum content of the supportive classes meet or exceed the expectations of your program.		25%	50%	25%		
7. The time of delivery and number of sections available are adequate to meet your students' needs.		75%				25%

Faculty Comments:

MEMORANDUM

DATE: November 17, 2004

TO: Academic Senate

FROM: Academic Program Review Council

RE: Recommendations for:

Bachelor of Science Degree in Manufacturing Engineering Technology

CC: Blaine Danley, Gary Ovans, Charles Matrosic, Thomas Oldfield, Michael Harris

IDENTITY OF PROGRAM:

BS Degree in Manufacturing Engineering Technology

RECOMMENDATION OF ACADEMIC PROGRAM REVIEW COUNCIL:

We recommend that this program be Continued

DESCRIPTION OF PROGRAM:

CATALOG ENTRY:

Why Choose Manufacturing Engineering Technology?

Did you used to drive your parents up the wall by taking things apart 'just to see how they were put together'? (Or do you still do this?) If so, Manufacturing Engineering Technology may be the program for you! Simply put, manufacturing engineers figure out how to make products—anything from tools to toys, cars to consumer goods, electronics to earthmovers.

Good manufacturing engineers can determine how to make their company's products better, faster, safer and less expensive than competitors can. These abilities are always in demand, and the Manufacturing Engineering Technology program at Ferris gives you the skills to command an excellent starting salary. You'll also get to work with state-of-the-art computers and equipment while you're here, plus get more valuable team and project experience than almost anywhere else.

Ferris students learn to identify and select materials based on production requirements and work closely with computer-aided design equipment (CAD/CAM). They conduct time studies, complete costs estimates, utilize computer software to aid in solving manufacturing problems, formulate plant layout requirements, understand management control systems, justify and select quality equipment and automated systems and design a total product manufacturing system. Students also receive on-the-job experience through an internship education program.

Get a Great Job

Manufacturing engineers get involved on the ground level of the production of a variety of industrial and consumer goods and develop the expertise to see production through to completion. Their knowledge of process design, analysis, planning, supervision, manufacturing methods and equipment is used from start to finish. The location of every machine, the movement of each tool or part, the order of operation and the selection of the machines themselves are all decisions that manufacturing engineers make as part of the total production process.

Employment opportunities for Manufacturing Engineering Technology graduates are found across the entire spectrum of manufacturing industries. Specific entry-level positions include manufacturing engineer, process engineer, production engineer, tool engineer, industrial engineer and quality engineer. Graduates of this program enjoy 100 percent placement and starting salaries averaging over $50,000.

Admission Requirements

Students entering the Manufacturing Engineering Technology program must have completed a two-year program at Ferris in CAD Drafting and Tool Design Technology, Manufacturing Tooling Technology, Mechanical Engineering Technology, Plastics Technology, Rubber Technology or Welding Technology. An A.A.S. degree in a manufacturing-based technology from another institution or 60 semester hours of college work including general courses, technical courses and technical-related courses is acceptable. Students must have at least a 2.75 GPA in their A.A.S. major courses and a 2.5 cumulative GPA.

Graduation Requirements

The Manufacturing Engineering Technology program at Ferris leads to a bachelor of science degree. Graduation requires a minimum 2.0 GPA in core classes, in the major and overall. Students must complete all general education requirements as outlined on the General Education website.

BACKGROUND INFORMATION OBTAINED FROM THE ACADEMIC PROGRAM REVIEW PROCESS:

CRITERIA SUMMARY BASED ON CONCLUSIONS OF THE PROGRAM PANEL:

- **Centrality to FSU Mission**
  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."
  - 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.
- **Uniqueness and 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.
- **Service to State and Nation and World**
  - 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, in addition to 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.
- **Demand by Students**
  - The MFGE program admits one new section of third-year students each fall semester. Demand has been relatively steady for the last decade, although in recent years the program has experienced some decline.
  - 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 13 to 17 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. A limited number of Manufacturing courses are offered at several other sites under the auspices of UCEL.
- **Demand for Graduates**
  - 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.
- **Placement Rate and Average Salary of Graduates**
  - The most recent university-wide salary survey showed an average starting salary of $52,411 for MFGE graduates, with 100% placement going all the way back to the very origins of the program.
- **Service to Non-Majors**
  - 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.
  - The MFGE faculty are open to discussing the inclusion of MFGE courses in any program on campus.
- **Quality of Instruction**
  - 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, have traditionally fared much better than students from competing schools on internationally recognized certification exams.
- Computer usage has become an important part of the MFGE program to the point that it has become a "laptop" program, following on the heels of the precedent set by the Product Design Engineering Technology program.

- **Facilities and Equipment**
  - 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 2005, the MFGE program has been allotted a total of $18,024.
    - A "life-saver" in recent years, has been the availability of off-campus incentive funds earned by the faculty, as a result of off-campus programming.
    - Program faculty have also vigorously sought out and obtained Meritorious Grants, one-time equipment funds, Faculty Development Grants, Marketing Grants, and Timme Grants.
    - 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

- **Library Information Resources**
  - 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, there is a great deal, and ever increasing amount of manufacturing-related information available on the Internet.
  - The opening of FLITE provided an opportunity, working with their personnel to greatly increase the quantity and quality of printed material made available in that facility to serve the program.
  - During the 2003-04 academic year, the program was assigned Swan 101. This room has space that will be dedicated a resource area, as that area goes through a refurbishment process.

- **Faculty:**

  Quantity and Qualifications:
  - 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.

  Professional and Scholarly Activities
  - 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

- **Administrative Effectiveness**
  - 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 Manufacturing Department Chair. 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 11 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 and Granger Center startup, a variety of 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.

COST INFORMATION:

According to the 2001-2002 report from institutional research:

Total cost per SCH

BS Degree in Manufacturing Engineering Technology	**$205.07**

Total program cost

BS Degree in Manufacturing Engineering Technology	**$16,200.83**

The panel states that 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.

ASSESSMENT OF THE PROGRAM BY THE ACADEMIC PROGRAM REVIEW COUNCIL:

OBSERVATIONS:

- The Degree Program Cost Document for 2001-2002 published by Institutional Research and Testing lists all programs; 2 year, 4 year, graduate, and professional degrees in the same table.
- The BS Degree in Manufacturing Engineering Technology is essentially a 2 year Upper Division Degree so the total costs reflect only the courses taken during the last two years.
- The BS Degree in Manufacturing Engineering Technology ranks 100/229 in programs at the University based on **total cost per student credit hour** ranked from high to low.
- The BS Degree in Manufacturing Engineering Technology ranks 116/229 in programs at the University based on **total program cost** ranked from high to low.
- The on-campus capacity of the program is 50 students.
- The on-campus enrollment in the program is summarized below:

1996	1997	1998	1999	2000	2001	2002	2003	2004
51	41	43	46	50	45	35	29	31

- The off-campus enrollment in the program is summarized below

	1996	1997	1998	1999	2000	2001	2002	2003	2004
MET	69	62	60	55	57	75	81	62	59
QET		7	13	6	13	14	19	16	

- The number of on-campus graduates in the program:

1999	2000	2001	2002	2003
22	11	19	21	22

- The number of off-campus graduates in the program:

1999	2000	2001	2002	2003
9	11	14	4	18

- The Administrative Program Review states that 5 FTE were assigned to this program in the Fall of 2003 with one of the faculty on .75 release time as Department Chair.
- The Administrative Program Review states that .83 FTE were assigned overload/supplemental in the Fall of 2003.
- The graduate survey was based on the FSU 2001/2002 Graduate Follow-up Study tabulated by Institutional Research and Testing. A survey was sent to 17 graduates. A total of 11 surveys were returned for a 65 % return rate.
- No information was provided with respect to the number of employer surveys distributed or the number of forms returned. A telephone survey or personal contact was made with 15 companies.
- A survey was administered to 14 3rd year students. A total of 14 surveys were returned for a 100 % return rate.
- A survey was administered to 9 4th year students. A total of 9 surveys were returned for a 100 % return rate.
- A survey was administered to 23 Grand Rapids students. A total of 23 surveys were returned for a 100 % return rate.
- The Faculty survey was sent to 16 non-MFGE faculty. A total of 4 surveys were returned for a 25 % return rate.
- The Faculty survey was sent to 6 MFGE faculty. A total of 6 surveys were returned for a 100 % return rate.

STRENGTHS OF THE PROGRAM

- The program has enthusiastic dedicated faculty
- The program faculty show an ingenious use of limited resources
- The program has an excellent history of placement of graduates with high starting salaries
- The reputation of the program across the State is high
- The program supports a large number of other programs – it functions as a technical "General Education" program for the College of Technology
- Graduates of this program are well prepared obtain an entry level position and for career advancement

THE ACADEMIC PROGRAM REVIEW COUNCIL HAS THE FOLLOWING COUNCERNS:

- The on-campus enrollment has declined in recent years
- There is no direct AAS feeder into the program

- The program does not have significant identifiable space that is allocated to it
  - It shares facilities "owned" by other programs
  - The program is facing competition from programs in other Universities with modern laboratory facilities designated to the program
- The funding process for S&E and Equipment in the College of Technology appears to be inequitable
- The program is not ABET accredited

THE ACADEMIC PROGRAM REVIEW COUNCIL RECOMMENDS THAT THE FOLLOWING STEPS BE TAKEN TO IMPROVE THE PROGRAM:

- Since the lack of a feeder program is hurting on campus enrollment:
  - The faculty and administration of this program should carry out a feasibility study to determine how the best way to address this issue
  - They should include in their consideration the possibility of making this a 4 year degree or creating a feeder AAS degree of their own
- University Marketing and Advancement, the College of Technology, and the Program faculty should develop strategies to identify appropriate target audiences and effectively market this program
- The program faculty and administration should continue to explore options to facilitate coordination with other programs with respect to sharing facilities and equipment
- The program faculty and administration should continue to evaluate the relationship with and the impact of the off-campus offerings on the on-campus degree program
  - They should determine ways to optimize the availability of the Grand Rapids facility with respect to instruction for both on and off campus students
- The College of Technology should reevaluate the procedures used in distribution of S & E funding to programs and allocation of equipment funds to insure more equitable distribution of funds
- In view of the present state of the economy and the University priority list for construction of new facilities, the College of Technology should carry out a comprehensive review of the allocation of rooms in the Swann Building to determine if the current space is being optimally utilized
- The program faculty and administration should apply for and obtain ABET accreditation

MANUFACTURING ENGINEERING TECHNOLOGY

BACHELOR OF SCIENCE PROGRAM

SELF STUDY FOR ACADEMIC PROGRAM REVIEW

Ferris State University
College of Technology
Big Rapids, Michigan 49307

September 10, 2004

SELF STUDY FOR ACADEMIC PROGRAM REVIEW

MANUFACTURING ENGINEERING TECHNOLOGY BACHELOR OF SCIENCE PROGRAM

College of Technology
Ferris State University
Big Rapids, Michigan 49307

September 10, 2004

Program Review Panel

Program Faculty

Blaine Danley, Chair
Assistant Professor of Manufacturing Engineering Technology
Gary L. Ovans
Professor of Manufacturing Engineering Technology, and Department Chair
Bruce Gregory
Professor of Manufacturing Engineering Technology
James A. Rumpf
Associate Professor of Manufacturing Engineering Technology
Mark Rusco
Assistant Professor of Manufacturing Engineering Technology
Joe Wist
Assistant Professor of Manufacturing Engineering Technology

Other Faculty/Outside of College

Tom Brownell
Professor, Languages and Literature

Individual/Special Interest

Greg Key
Professor, Department Chair, Automotive

Industry Representative

Mark Herman
Senior Manufacturing Engineer, Hilite International

PREFACE

The Manufacturing Engineering Technology (MFGE) BS program was selected for academic program review in the 2003-2004 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. 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.

We 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

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 in 1976, because that is what the MFGE program has been doing now for over 22 years.

The FSU web site in summary, 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 have 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 number of group projects and technical presentations the students are responsible for in the space of only two years. There 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 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 at the end of the section.

- Quality of our program - 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 area 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, and concerns about the level of resources availing themselves to support such proposals.
- 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 limited resources for equipment.

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

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

What factors limit program capacity? *1) Physical resources. 2) Supply and expense budget. 3) spread thin addressing needs of on-campus / off-campus (ATC) and service to related courses*

Financial

Expenditures*	FY 99	FY 00	FY 01	FY 02	FY 03
Supply & Expense	$14,739	$16,713	$24,363	$55,374	$54,737
Faculty Prof. Development					
General Fund			$235		$2,089
Non-General Fund					
UCEL Incentives					
FSU-GR Incentives					
Equipment					
Voc. Ed. Funds					
General Fund	$1,851	0	$7,647	$19,735	$13,835
Non-General Fund					
UCEL Incentives					
FSU-GR Incentives					

*Use end of fiscal year expenditures.

If you spent UCEL and FSU-GR incentive money for initiatives/items other than faculty professional development and equipment, what were they? Explain briefly. Please also include amounts spent on each initiative/item.

Revenues	FY 99	FY 00	FY 01	FY 02	FY 03
Net Clinic Revenue	N/A	N/A	N/A	N/A	N/A
Scholarship Donations	$2,200	$2,200	$2,400	$2,400	$3,900
Gifts, Grants, & Cash Donations					
Endowment Earnings					
Institute Programs/Services					
In-Kind	$1,836	$507	$2,735	$7,900	$9,928

Other

	AY 98-99	AY 99-00	AY 00-01	AY 01-02	AY 02-03
Number of Graduates* - Total	31	22	33	25	40
- On campus	22	11	19	21	22
- Off campus	9	11	14	4	18
Placement of Graduates	100%	100%	100%	100%	100%
Average Starting Salary	$38,500	$49,225	$51,326		
Productivity - Academic Year Average	358	426	431	465	461
- Summer	132	122	135	153	192
Summer Enrollment	0/0		52		

* Use total for full year (S, F, W)

1. a) Areas of Strength:

- Manufacturing Engineering Technology program has an excellent history of quality placement of graduates and high starting salaries.
  - ***100% job placement*** *of graduates at $50,000+ median starting salary.*
- *Reputation across the state is high, which attracts community college graduates.*
- *Many 2-year programs – internal and external to FSU – ladder into the program.*
- *Supports a large number of other programs through the offering of 'relateds'.*
- *Recognized as a quality program through Program Review process.*
- *Innovative and creative faculty – well educated and resourceful.*
- ***Consistently one of the most productive programs in the COT.***
- *One faculty on .75 release*
- *Productivity for* ***MATL*** *prefixed coursework –* ***577 SCH/FTEF*** *(2003)*

b) Areas of Concern and Proposed Actions to Address Them:

- *Provide advising information to students in A.A.S. programs at all locations.*
  - *Establish articulation arrangements with feeder locations.*
- ***Lack of appropriate facilities for MFGE and MATL offerings.***
  - *Reference Program Planning Form: The plan is multi-step in nature. 1) Define facility requirements based on curriculum projection (initial steps completed). 2) Survey industry to identify future industry requirements. 3) Secure administrative/industrial/financial support (currently being initiated).*
  - *While program is unique, other programs at other universities in Michigan are cloning the Manufacturing program and are enhancing their programs with lab facilities.*
  - *Require administrative support to help surmount problems. Link-up with supporters in industry and alumni to generate political and financial support.*
- *Internal/external competition for students.*
  - *Develop AAS.*
  - *Create facility to assist in marketing program and support curriculum needs.*
  - *Recruiting and programmatic marketing effort..*

2. Future goals (please give time frame):

- *Curriculum revision (ABET accreditable) – revise B.S. degree and create A.A.S. degree. (Fall/winter 2004).*
- *Foster cross-curriculum projects to replicate industrial project teams (2003).*
- *Establish Engineering Technology facility. (past due).*

3. Other Recommendations:

- *Per the findings of the Academic Program Review process, Fall 1998.* ***"This is an excellent program that may soon become irrelevant".*** ** if it not enhanced per APRC recommendations. *Comment – APRC Chair*
- *Establish a production/technology facility to aid in meeting student learning goals and market this and other COT programs.*

4. Does the program have an advisory committee? *YES*

a) If yes, when did it last meet? *Spring 2003*

b) If no, why not? By what other means do faculty receive advice from employers and outside professionals?
By attending workshops, seminars, conferences and with input from employers, students and alumni, the faculty are always gaining advice from outside professionals.

c) When were new members last appointed? *Spring 2003*

d) What is the composition of the committee (how many alumni, workplace representatives, academic representatives)? *Alumni 5, Workplace representatives 12*

e) Please attach the advisory committee charge, if there is one.

5. Does the program have an internship or other cooperative or experiential learning course? *YES*

a) If yes, is the internship required or recommended? *Required (may be waived if student has history of appropriate experience.*

b) If no, what is the reason for not requiring such an experience?

c) How many internships take place per year? What percentage of majors has internships?
Varies as to size of class and number of students eligible to waive the requirement. 100 percent of those who need to fulfill the requirement.

6. Does the program offer courses through the web? *NO*

a) Please list the web-based courses (those delivered primarily through the internet) the program offered last year?

b) Please list the web-assisted courses the program offered last year.

7. What is unique about this program?

a) For what distinctive characteristics is it known, or should it be known, in the state or nation?
"Job Ready" graduates that can deliver and earn their keep starting day-one of employment.

b) What are some strategies that could lead to (greater) recognition?
REQUIRE AN ENGINEERING TECHNOLOGY FACILITY THAT WOULD SUPPORT THIS, AS WELL AS OTHER PROGRAMS IN THE COT.. THIS WOULD ALLOW THE IMPLEMENTATION OF CROSS-CURRICULUM INTEGRATION, i.e. LEAP-FROGGING OTHER PROGRAMS/SCHOOLS IN INNOVATIVE DELIVERY OF TECHNICAL EDUCATION

8. Is the program accredited? By whom? If not, why? When is the next review?
No. Current curricula does not support ABET under advisement by industrial advisory board. Board advises not to seek ABET if it results in reducing experiential components of curricula to increase math/theory component. Will re-visit this issue at next advisory board meeting in April 2004.

9. What have been some major achievements by students and/or graduates of the program? By faculty in the program? *Many have moved vertically in domestic and multinational organizations, assuming positions as: plant managers, superintendents, vice presidents and presidents. Recognition as outstanding faculty through the receipt of university-wide awards.*

10. Questions about Program Outcomes Assessment/Assessment of Student Learning at the Program Level (Attach additional sheets, if necessary.)

a) What are the program's learning outcomes?
The Manufacturing faculty have taken an integrated approach to student outcomes assessment. The program assessment plan attempts to unite the following on-going activities:

1. *Unit Action Plans*
2. *Program Review*
3. *Curriculum changes*
4. *Alumni, Employer and Advisory Board Constituencies*
5. *Welfare and long-term success of the student*

To assess student success in meeting the expectations of the Manufacturing Engineering Technology program coursework – to include long-term retention and demonstration of ability.

b) What assessment measures are used, both direct and indirect?
Outcomes to be measured to achieve the goal:

Students:	*Tests, projects (team and individual) presentations/ Pre/post tests implemented 2003/2004 as replacement for SME certification exam*
Courses:	*Student evaluations, advisory group input.*
Major:	*Advisor group input, graduate and employer surveys, Academic Program Review.*

c) What are the standards for assessment results? *Standard MFGE grading scale pre-test results are compared to post-test results.*

d) What were the assessment results for 2002-03? *SME Certification exam*
2001-02 46% pass rate *2002-03 Unknown*
2000-01 39% pass rate
1999-00 50% pass rate
1998-99 59% pass rate

e) How will / how have the results been used for pedagogical or curricular change?
Evaluate effectiveness of program coursework in meeting students' needs with respect to improving communication skills, problem solving skills, and achieve a sufficient body of knowledge and expertise in their major area of ensure adequate preparation for employment. Results will be reviewed by: Department faculty and industrial advisory board.

11. Questions about Course Outcomes Assessment:

a) Do all multi-sectioned courses have common outcomes? *YES*

b) If not, how do you plan to address discrepancies? *Change curriculum and instructional methodology as needed.*

c) Do you keep all course syllabi on file in a central location? *YES*

*If you have questions about the outcomes assessment portions of this survey, please contact Laurie Chesley (x2713).

Form Completed by_____
Name and Title / Date

Reviewed by Dean_____
Name / Date

Comments by Dean:

7-25-03

To: Weilin Chang PhD., Dean, College of Technology
From: Gary Ovans, Dept. Chair, Manufacturing Dept.
Subject: Review of Departmental Program's Competition

This is a review of programs, statewide, that are viewed as providing competition for Manufacturing Department program student recruitment. Information with respect to these programs was obtained from onsite visits, review of published materials, websites, and communication with staff at various sites. The offerings at these sites were evaluated against the B.S. Manufacturing Engineering Technology, B.S. Quality Engineering Technology, and A.A.S. Manufacturing Tooling Technology.
The Results are as follows:

FSU Program: B.S. Manufacturing Engineering Technology

University/Program: Central Michigan University/Industrial and Engineering Technology
Advantages:

- Geographical location
- Relatively new engineering/engineering technology facility with laboratories incorporated to support curriculum
- Large campus student population and good name recognition (University)

Disadvantages:

- Engineering facility inefficiently designed
  - Wasted space
  - Labs lack the depth and breadth of comparable lab areas located at Ferris State University that support activities, such as, welding, machine tool, plastics, and design
- Faculty are more accustomed to theory than practice
- Manufacturing curriculum is not as strong as the Ferris equivalent

CMU's central location and proximity to interstate 27, offers prospective students from what has been, historically, a source of students for Ferris State University, a logistically, more convenient place to go to school. Employers of graduates from both universities, have indicated to me that the FSU grads are better prepared for their manufacturing careers.

University/Program: Eastern Michigan University/B.S. Manufacturing Engineering Technology/Manufacturing Technology

Advantages:

- Proximity to Detroit Metropolitan Area with its extensive industrial base and student population
- Lab facilities (not yet located in information on website)
- M.S. in Quality is offered

Disadvantages:

- Does not have the extensive lab facilities as does FSU A.A.S. programs

Eastern Michigan has a reputation for 'weaker' technical degree offerings than Ferris, however, by offering the B.S. in MET, Eastern can offer by virtue of its convenient location to Detroit, an alternative for students to go to school there, rather than relocate all the way to Big Rapids.

University/Program: Lake Superior State University/Manufacturing Engineering Technology Dept. (Robotics Focus)

A small program with limited resources, this program is not considered as very strong competition for Ferris' programs, however, it may draw a few students from the eastern U.P. and northern Michigan who might otherwise consider programs at Ferris.

University/Program: Grand Valley State University/B.S. Engineering with Manufacturing Emphasis

Advantages:

- Tremendous support from large metropolitan area in terms of student market and financial resources
- Offers graduate degree in Manufacturing Operations
- New lab facility linked to Eberhardt Center and Padnos School of Engineering in downtown Grand Rapids
- Convenient for GVSU to work on collaborative projects with the extensive Grand Rapids industrial base

Disadvantages:

- Focus is more on theory than practical application
- B.S. Engineering does not permit the ready articulation of community college graduates into the 'pure' engineering program

University/Program: Michigan Technological University/Mechanical Engineering (Manufacturing Focus)

Advantages:

- Recent investment in facilities with $3.2 million upgrade to 50,000 square foot lab area
- Program appeal to academically strong student
- University reputation as strong engineering school

Disadvantages:

- Primary focus is on theory and research
- Remote location of facility

University/Program: Northern Michigan University/Industrial Technology

Advantages:

- Convenient location for central and western U.P. students who may consider Ferris if NMU program did not exist

Disadvantages:

- Curriculum "lite"

University/Program: UW-Stout/Industrial Engineering Technology and Manufacturing Engineering

Advantages:

- Excellent labs
- Competent faculty
- Good reputation

Disadvantages:

- Geographic location makes it practical to appeal to only students from western end of Michigan's upper peninsula

University/Program: Wayne State University/Industrial Engineering (Manufacturing Option)

Advantages:

- Relatively new facility (1996) built to support manufacturing related programs
- Location in metropolitan area with a large base of students and industry

Not considered as a primary competitor of FSU programming.

University/Program: Western Michigan University/Manufacturing Engineering Technology

Advantages:

- Good reputation for engineering and engineering technology
- Recent completion of $72 million (324,000 sq. ft.) engineering facility with extensive labs designed to support curriculum
- Good location with respect to student base and industrial support
- Attractive to potential students
- Graduate programs available
- Aggressive plan in place to expand operations
- Not confused with respect to the Universities mission and identity

Disadvantage:

- Technology students do not seem as well prepared to be 'job-ready' as do Ferris graduates
- Articulation with community college programs not well developed

Western Michigan is an aggressive competititor for Ferris State University programming, not just in the Kalamazoo region, but throughout western and northern Michigan.

Summary comments: Although Western Michigan University and Central Michigan University have developed manufacturing related programs that compete with FSU MET on a regional basis, the bulk of competition has been created internally. The B.S. in Manufacturing Engineering Technology was the first technical B.S. offered in the College of Technology. Several programs have been created in recent years that draw from the same pool of students with the B.S. in Mechanical Engineering Technology, being the most recent.

FSU Program: B.S. Quality Engineering Technology

The Lansing, Macomb, and Mott Community Colleges, offer A.A.S. Quality Technology degrees. Eastern Michigan University offers a Master of Science in Quality. Currently, Ferris State University is the only organization offering the B.S. Quality Engineering Technology.

FSU Program: A.A.S. Manufacturing Tooling Technology

Twenty-five of the states twenty-eight community colleges offer associate degrees addressing Manufacturing Tooling Technology content at some level, as do a number of M-TEC centers. None of them have as extensive a program as does the A.A.S. Manufacturing Tooling Technology program at Ferris. The strongest competition is that offered by the program at Grand Rapids Community College. GRCC has the benefit of being located in a large metropolitan area with an extensive industrial base. The program at Ferris has the benefit of a more extensive lab and a faculty that has very comprehensive knowledge and experience in all areas of tooling technology.

Section 2

Graduate Survey

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 the FSU 2001/2002 Graduate Follow-up Study tabulated by Institutional Research & Testing was 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 are attached and an analysis follows.

B. FSU 2001/2002 GRADUATE FOLLOW-UP STUDY

Although this study represented the entire university, program specific data was found representing our Manufacturing Engineering technology students. This study represents the annual salaries for doctorate, master, and bachelor degree graduates. Please note that the average salary reported by our students was $52,411, which was the highest average salary of all 11 bachelor degrees in the College of Technology. The average salary was only exceeded university-wide by the Doctorate of Optometry, and B.S. and P.D. of Pharmacy degrees. The entire University tabulated results showing MFGE placement are attached at the end of this section.

C. QUESTIONNAIRE SUPPLEMENT

The purpose of this supplement (attached) 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 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 comments have been discussed by the program faculty, and since our curriculum is continually being evaluated, appropriate changes will be made as required.

- The graduate questionnaire supplement was segmented into 5 groups based on date of graduation.
    - 1978 – 1981 graduates
    - 1982 – 1986 graduates
    - 1987 – 1992 graduates
    - 1993 – 1998 graduates
    - 1999 – 2003 graduates

2001/2002
FERRIS STATE UNIVERSITY
GRADUATE FOLLOW-UP
RANK BY COLLEGE AVERAGE STARTING SALARY
SOURCE OF DATA: INSTITUTIONAL RESEARCH & TESTING

RANK	DEGREE	PROGRAM	COLLEGE	# REPORTING	AVG. SALARY	TOTAL SALARY	COLLEGE AVERAGE
1	BS	Applied Biology	A&S	12	$ 28,115	$ 337,380	A&S $ 24,512
2	BSW	Social Work	A&S	15	$ 23,200	$ 348,000	
3	BS	Applied Speech Communication	A&S	8	$ 21,568	$ 172,544	
4	BS	Nursing, Professional	AHS	39	$ 41,852	$ 1,632,228	AHS $ 38,686
5	BS	Medical Records Administration	AHS	3	$ 38,945	$ 116,835	
6	BS	Environmental Health & Safety Management	AHS	5	$ 37,623	$ 188,115	
7	BS	Medical Technology	AHS	5	$ 33,288	$ 166,440	
8	BS	Health Care Systems Administration	AHS	14	$ 32,118	$ 449,652	
9	MISM	Information Systems Management	BUS	33	$ 46,570	$ 1,536,810	BUS $ 34,835
10	BS	Computer Information Systems	BUS	36	$ 39,570	$ 1,424,520	
11	BB	Accountancy	BUS	17	$ 33,826	$ 575,042	
12	BB	Marketing	BUS	14	$ 29,876	$ 418,264	
13	BB	Human Resource Management	BUS	9	$ 29,308	$ 263,772	
14	BB	Advertising	BUS	8	$ 29,095	$ 232,760	
15	BB	Marketing/Pro Golf Management	BUS	29	$ 28,640	$ 830,560	
16	BB	Business Administration	BUS	25	$ 28,106	$ 702,650	
17	BB	Small Business Management	BUS	4	$ 27,952	$ 111,808	
18	MS	Career and Technical Education	EHS	17	$ 43,229	$ 734,893	EHS $ 33,915
19	MSCJ	Criminal Justice Administration	EHS	14	$ 39,710	$ 555,940	
20	BS	Criminal Justice	EHS	48	$ 33,670	$ 1,616,160	
21	BS	Technical Education	EHS	7	$ 27,463	$ 192,241	
22	BS	English Education	EHS	18	$ 27,114	$ 488,052	
23	BS	Biology Education	EHS	8	$ 26,405	$ 211,240	
24	BFA	Visual Communication	KEN	15	$ 28,475	$ 427,125	KEN $ 28,387
25	BFA	Interior Design	KEN	11	$ 28,268	$ 310,948	
26	OD	Optometry	OPT	14	$ 52,781	$ 738,934	OPT $ 52,781
27	BS	Pharmacy	PHR	54	$ 84,270	$ 4,550,580	PHR $ 81,406
28	PD	Pharmacy	PHR	7	$ 59,311	$ 415,177	
29	BS	Manufacturing Engineering Technology	TEC	13	$ 52,411	$ 681,343	TEC $ 46,131
30	BS	Welding Engineering Technology	TEC	17	$ 51,735	$ 879,495	
31	BS	Plastics Engineering Technology	TEC	24	$ 49,552	$ 1,189,248	
32	BS	HVACR Engineering Technology	TEC	15	$ 48,952	$ 734,280	
33	BS	Electrical/Electronic Engineering Technology	TEC	9	$ 47,534	$ 427,806	
34	BS	Product Design Engineering Technology	TEC	11	$ 46,910	$ 516,010	
35	BS	Heavy Equipment Service Engineering	TEC	9	$ 45,680	$ 411,120	
36	BS	Surveying Engineering	TEC	8	$ 42,690	$ 341,520	
37	BS	Construction Management	TEC	18	$ 42,493	$ 764,874	
38	BS	Auto & Heavy Equipment Management	TEC	22	$ 39,567	$ 870,474	
39	BS	Printing Management	TEC	6	$ 32,630	$ 195,780	
		UNIVERSITY TOTALS		**641**		**$ 26,760,620**	
		UNIVERSITY AVERAGE			**$ 41,748**		

2001/2002
FERRIS STATE UNIVERSITY
GRADUATE FOLLOW-UP
RANK BY AVERAGE STARTING SALARY
SOURCE OF DATA: INSTITUTIONAL RESEARCH & TESTING

RANK	DEGREE	PROGRAM	COLLEGE	# REPORTING	AVG. SALARY	TOTAL SALARY
1	BS	Pharmacy	PHR	54	$ 84,270	$ 4,550,580
2	PD	Pharmacy	PHR	7	$ 59,311	$ 415,177
3	OD	Optometry	OPT	14	$ 52,781	$ 738,934
4	BS	Manufacturing Engineering Technology	TEC	13	$ 52,411	$ 681,343
5	BS	Welding Engineering Technology	TEC	17	$ 51,735	$ 879,495
6	BS	Plastics Engineering Technology	TEC	24	$ 49,552	$ 1,189,248
7	BS	HVACR Engineering Technology	TEC	15	$ 48,952	$ 734,280
8	BS	Electrical/Electronic Engineering Technology	TEC	9	$ 47,534	$ 427,806
9	BS	Product Design Engineering Technology	TEC	11	$ 46,910	$ 516,010
10	MISM	Information Systems Management	BUS	33	$ 46,570	$ 1,536,810
11	BS	Heavy Equipment Service Engineering	TEC	9	$ 45,680	$ 411,120
12	MS	Career and Technical Education	EHS	17	$ 43,229	$ 734,893
13	BS	Surveying Engineering	TEC	8	$ 42,690	$ 341,520
14	BS	Construction Management	TEC	18	$ 42,493	$ 764,874
15	**BS**	**Nursing, Professional**	**AHS**	**39**	$ 41,852	$ 1,632,228
16	MSCJ	Criminal Justice Administration	EHS	14	$ 39,710	$ 555,940
17	BS	Computer Information Systems	BUS	36	$ 39,570	$ 1,424,520
18	BS	Auto & Heavy Equipment Management	TEC	22	$ 39,567	$ 870,474
19	BS	Medical Records Administration	AHS	3	$ 38,945	$ 116,835
20	BS	Environmental Health & Safety Management	AHS	5	$ 37,623	$ 188,115
21	BB	Accountancy	BUS	17	$ 33,826	$ 575,042
22	BS	Criminal Justice	EHS	48	$ 33,670	$ 1,616,160
23	BS	Medical Technology	AHS	5	$ 33,288	$ 166,440
24	BS	Printing Management	TEC	6	$ 32,630	$ 195,780
25	BS	Health Care Systems Administration	AHS	14	$ 32,118	$ 449,652
26	BB	Marketing	BUS	14	$ 29,876	$ 418,264
27	BB	Human Resource Management	BUS	9	$ 29,308	$ 263,772
28	BB	Advertising	BUS	8	$ 29,095	$ 232,760
29	BB	Marketing/Pro Golf Management	BUS	29	$ 28,640	$ 830,560
30	BFA	Visual Communication	KEN	15	$ 28,475	$ 427,125
31	BFA	Interior Design	KEN	11	$ 28,268	$ 310,948
32	BS	Applied Biology	A&S	12	$ 28,115	$ 337,380
33	BB	Business Administration	BUS	25	$ 28,106	$ 702,650
34	BB	Small Business Management	BUS	4	$ 27,952	$ 111,808
35	BS	Technical Education	EHS	7	$ 27,463	$ 192,241
36	BS	English Education	EHS	18	$ 27,114	$ 488,052
37	BS	Biology Education	EHS	8	$ 26,405	$ 211,240
38	BSW	Social Work	A&S	15	$ 23,200	$ 348,000
39	BS	Applied Speech Communication	A&S	8	$ 21,568	$ 172,544
40						
41						
42						
43						
44						
		UNIVERSITY TOTALS		641		$ 26,760,620
		UNIVERSITY AVERAGE			$ 41,748	

2001/2002 Graduate Follow-Up Survey Summary

College: Technology

Program Name	Degree	# of Grads	% Response	# Responses	Placement Rate	# Job &/or CE	Ave Salary	Median
Automotive Body	AAS	9	78%	7	100%	7	N/AV	N/AV
Architectural Technology	AAS	26	35%	9	100%	9	N/AV	N/AV
Automotive Service Technology	AAS	48	67%	32	97%	31	$ 34,876	$ 33,159
Building Construction Technology	AAS	37	81%	30	100%	30	$ 33,695	$ 32,415
CAD Drafting & Tool Design Technology	AAS	22	68%	15	100%	15	N/AV	N/AV
Civil Engineering Technology	AAS	8	50%	4	100%	4	N/AV	N/AV
Industrial Electronics Technology	AAS	9	78%	7	100%	7	$ 32,641	$ 31,229
Heavy Equipment Technology	AAS	31	74%	23	96%	22	$ 35,118	$ 35,746
HVACR Technology	AAS	27	93%	25	100%	25	$ 34,764	$ 39,955
Mechanical Engineering Technology	AAS	17	65%	11	100%	11	$ 32,877	$ 30,894
Manufacturing Tooling Technology	AAS	21	71%	15	100%	15	$ 36,940	$ 34,712
Printing and Digital Graphic Imaging Technology	AAS	15	73%	11	100%	11	$ 25,879	$ 23,991
Plastics Technology	AAS	44	89%	39	100%	39	N/AV	N/AV
Printing Technology	AAS	3	33%	1	100%	1	N/AV	N/AV
Rubber Technology	AAS	14	79%	11	100%	11	N/AV	N/AV
Surveying Technology	AAS	3	33%	1	100%	1	N/AV	N/AV
Welding Technology	AAS	23	83%	19	100%	19	N/AV	N/AV
Automotive Engineering Technology	BS	1	0%	0	0%	0	N/AV	N/AV
Automotive and Heavy Equipment Management	BS	33	70%	23	96%	22	$ 39,567	$ 39,013
Computer Networks and Systems	BS	12	50%	6	83%	5	N/AV	N/AV
Construction Management	BS	36	53%	19	95%	18	$ 42,493	$ 40,288
Electrical/Electronics Engineering Technology	BS	20	50%	10	90%	9	$ 47,534	$ 46,927
Facilities Management	BS	9	44%	4	100%	4	N/AV	N/AV
Heavy Equip Service Engineering Tech	BS	12	75%	9	100%	9	$ 45,680	$ 42,631
HVACR Engineering Technology	BS	23	70%	16	94%	15	$ 48,952	$ 47,215
Manufacturing Engineering Technology	BS	25	56%	14	93%	13	$ 52,411	$ 49,697
New Media Printing and Publishing	BS	3	33%	1	100%	1	N/AV	N/AV
Product Design Engineering Technology	BS	26	46%	12	92%	11	$ 46,910	$ 44,873
Plastics Engineering Technology	BS	41	59%	24	100%	24	$ 49,552	$ 48,966
Printing Management	BS	10	70%	7	86%	6	$ 32,630	$ 31,884
Quality Engineering Technology	BS	1	0%	0	0%	0	N/AV	N/AV
Rubber Engineering Technology	BS	7	57%	4	100%	4	N/AV	N/AV
Surveying Engineering	BS	11	73%	8	100%	8	$ 42,690	$ 41,337
Welding Engineering Technology	BS	26	65%	17	100%	17	$ 51,735	$ 50,284
College of Technology Total		**653**	**66.5%**	**434**	**98%**	**424**	**$ 40,365**	
							Undergrad Ave	
Ferris State University Total		**2284**	**59.3%**	**1355**	**96.4%**	**1306**		

FERRIS STATE UNIVERSITY

Questionnaire Supplement **Manufacturing Engineering Technology**

In the following section, each question is to be answered in two parts. For each activity listed, please 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 Technology program should increase, decrease, or maintain the level of content of each activity in the program.

1978 – 1981 Graduates

ACTIVITY	Highly Relevant	Relevant	Somewhat Relevant	Not Relevant	Increase	Keep Same	Decrease
Ability to evaluate work methods	42.9%	42.9%	14.3%			100.0%	
Ability to establish time standards	14.3%	42.9%	28 6%	14.3%		100.0%	
Ability to estimate product costs related to manufacturing	85.7%		14.3%		42.9%	57.1%	
Ability to perform economic evaluation of project	57.1%		14.3%	14.3%	42.9%	57.1%	
Application of statistical process control techniques	28.6%	42.9%	14.3%	14.3%	42.9%	57.1%	
Application of facilities planning techniques		57.1%	28.6%	14.3%		100.0%	
Ability to perform statistically designed experiments	14.3%	28.6%	28.6%	14.3%	42.9%	42.9%	14.3%
Automation and systems design	14.3%	71.4%		14.3%	14.3%	85.7%	
Process planning	71.4%	14.3%		14.3%	28.6%	57.1%	
Production and inventory control	14.3%	28.6%	57.1%		14.3%	57.1%	
Use of computer for manufacturing applications	85.7%	14.3%			57.1%	42.9%	
Understand production machining processes	57.1%	28.6%		14.3%	28.6%	71.4%	
Understand production plastics processes	14.3%	42.9%	28.6%	14.3%		85.7%	14.3%
Understand production pressworking processes	14.3%	42.9%	28.6%	14.3%		100.0%	
Proper use and implementation of measurement systems	14.3%	57.1%	28.6%		57.1%	42.9%	
Technical reports and presentations	57.1%	28.6%	14.3%		57.1%	42.9%	
Understanding concepts of tool engineering	14.3%	57.1%	14.3%	14.3%	14.3%	57.1%	
Cutting tools and machinability		57.1%	14.3%	28.6%	14.3%	57.1%	
High performance tool materials		42.9%	42.9%	14.3%		57.1%	14.3%
Jig, fixture design and work holding	14.3%	71.4%		14.3%	14.3%	85.7%	
Special tooling and tooling applications		57.1%		14.3%	14.3%	85.7%	
Technical electives							
CAD/CAM	28.6%	57.1%	14.3%		42.9%	57.1%	
Electronics	14.3%	42.9%	28.6%	14.3%	57.1%	28.6%	
Metallurgy – material science		71.4%	14.3%	14.3%		85.7%	14.3%
Communication skills	85.7%	14.3%			71.4%	28.6%	
Required math level	28.6%	57.1%	14.3%		28.6%	71.4%	
Other elements of your educational experience							
Internship	28.6%	71.4%			42.9%	42.9%	
Plant visits	42.9%	57.1%			42.9%	57.1%	
Guest speakers	14.3%	28.6%	42.9%		28.6%	57.1%	14.3%
Facilities to support lab activities	57.1%	28.6%	14.3%		42.9%	57.1%	

Current Work Experience

Please list three job functions related to your current position:

If you have any further comments, please write them on the back of this form. Thank you.

FERRIS STATE UNIVERSITY

Questionnaire Supplement **Manufacturing Engineering Technology**

In the following section, each question is to be answered in two parts. For each activity listed, please 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 Technology program should increase, decrease, or maintain the level of content of each activity in the program.

1982 – 1986 Graduates

ACTIVITY	Highly Relevant	Relevant	Somewhat Relevant	Not Relevant	Increase	Keep Same	Decrease
Ability to evaluate work methods	57.1%	35.7%	7.1%		16.7%	83.3%	
Ability to establish time standards	28.6%	35.7%	35.7%		8.3%	91.7%	
Ability to estimate product costs related to manufacturing	92.8%	7.1%			66.7%	33.3%	
Ability to perform economic evaluation of project	78.6%	14 3%	7.1%		75.0%	25.0%	
Application of statistical process control techniques	50.0%	35.7%	7.1%	7.1%	33.3%	66.7%	
Application of facilities planning techniques	28.6%	57.1%	14.3%		16 7%	83.3%	
Ability to perform statistically designed experiments	28.6%	35.7%	21.4%	14.3%	41.7%	50.0%	8.3%
Automation and systems design	35.7%	35.7%	28.6%		25.0%	75.0%	
Process planning	71.4%	21.4%	7.1%		25.0%	75.0%	
Production and inventory control	21.4%	42.9%	35.7%		25.0%	75.0%	
Use of computer for manufacturing applications	71.4%	21 4%	7.1%		50.0%	50.0%	
Understand production machining processes	50.0%	21.4%	14.3%	14.3%	25.0%	75.0%	
Understand production plastics processes	21.4%		42.9%	35.7%	25.0%	75.0%	
Understand production pressworking processes	28.6%	21.4%	28.6%	21.4%	25.0%	75.0%	
Proper use and implementation of measurement systems	57.1%	35.7%	7.1%		50.0%	50.0%	
Technical reports and presentations	50.0%	42.9%	7.1%		50.0%	50.0%	
Understanding concepts of tool engineering	42.9%	35.7%	14.3%	7.1%	25.0%	58.3%	16.7%
Cutting tools and machinability	42.9%	21.4%	28.6%	21.4%	16.7%	75.0%	8.3%
High performance tool materials	21.4%	28.6%	28.6%	21.4%		91.7%	8.3%
Jig, fixture design and work holding	28.6%	50.0%	7.1%	14.3%	25.0%	75.0%	
Special tooling and tooling applications	28.6%	42.9%	14.3%	14.3%		91.7%	8.3%
Technical electives							
CAD/CAM	42.9%	42.9%		7.1%	25.0%	75.0%	
Electronics	7.1%	42.9%	28.6%	7.1%	8.3%	83.3%	8.3%
Metallurgy – material science	50.0%	28.6%	21.4%		25.0%	75.0%	
Communication skills	85.7%	14.3%			50.0%	50.0%	
Required math level	28.6%	71.4%			16.7%	83.3%	
Other elements of your educational experience							
Internship	71.4%	28.6%			41.7%	58.3%	
Plant visits	42.9%	57.1%			58.3%	41.7%	
Guest speakers	21.4%	50.0%	14.3%	14.3%	33.3%	50.0%	16.7%
Facilities to support lab activities	50.0%	35.7%	14.3%		50.0%	50.0%	

Current Work Experience

Please list three job functions related to your current position:

If you have any further comments, please write them on the back of this form. Thank you.

FERRIS STATE UNIVERSITY

Questionnaire Supplement **Manufacturing Engineering Technology**

In the following section, each question is to be answered in two parts. For each activity listed, please 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 Technology program should increase, decrease, or maintain the level of content of each activity in the program.

1987 – 1992 Graduates

ACTIVITY	Highly Relevant	Relevant	Somewhat Relevant	Not Relevant	Increase	Keep Same	Decrease
Ability to evaluate work methods	50.0%	30.0%	10.0%	10.0%	40.0%	60.0%	
Ability to establish time standards	30.0%	30.0%	20.0%	20.0%	20.0%	60.0%	20.0%
Ability to estimate product costs related to manufacturing	50.0%	30.0%	10.0%	10.0%	50.0%	50.0%	
Ability to perform economic evaluation of project	50.0%	20.0%	20.0%	10.0%	60.0%	30.0%	
Application of statistical process control techniques	10.0%	60.0%	20.0%	10.0%		80.0%	
Application of facilities planning techniques	10.0%	60.0%	10.0%	10.0%	10.0%	70.0%	
Ability to perform statistically designed experiments	10.0%	30.0%	40.0%	10.0%	30.0%	30.0%	20.0%
Automation and systems design	40.0%	40.0%	10.0%	10.0%	30.0%	40.0%	10.0%
Process planning	30.0%	50.0%	10.0%	10.0%	30.0%	70.0%	
Production and inventory control	20.0%	20.0%	30.0%	10.0%	20.0%	30.0%	30.0%
Use of computer for manufacturing applications	50.0%	30.0%		10.0%	10.0%	90.0%	
Understand production machining processes	50.0%	30 0%	20.0%		20.0%	60.0%	
Understand production plastics processes	40.0%	30.0%	10.0%	10.0%	30.0%	40.0%	
Understand production pressworking processes	40.0%	30.0%	10.0%		20.0%	60.0%	
Proper use and implementation of measurement systems	20.0%	40.0%	30.0%			70.0%	
Technical reports and presentations	30.0%	50.0%	30.0%		20.0%	70.0%	
Understanding concepts of tool engineering	50.0%	30.0%	20.0%		30.0%	50.0%	10.0%
Cutting tools and machinability	10.0%	30.0%	30.0%	10.0%	30.0%	50.0%	20.0%
High performance tool materials	30.0%	10.0%	50.0%	10.0%	20.0%	70.0%	
Jig, fixture design and work holding	40.0%	40.0%	20.0%		10.0%	80.0%	
Special tooling and tooling applications	20.0%	40.0%	40.0%		10.0%	70.0%	
Technical electives							
CAD/CAM	60.0%	40.0%			30.0%	60.0%	
Electronics		60.0%	20.0%	20.0%	20.0%	70.0%	
Metallurgy – material science	10.0%	70.0%	20.0%			80.0%	10.0%
Communication skills	60.0%	30.0%			60.0%	30.0%	
Required math level	50.0%	40.0%	10.0%		30.0%	50.0%	10.0%
Other elements of your educational experience							
Internship	60.0%	30.0%	10.0%		50.0%	40.0%	
Plant visits	30.0%	40.0%	20.0%	10.0%	30.0%	60.0%	
Guest speakers	20.0%	40.0%	30.0%	10.0%	30.0%	60.0%	
Facilities to support lab activities	40.0%	50.0%	10.0%		30.0%	60.0%	

Current Work Experience

Please list three job functions related to your current position:

If you have any further comments, please write them on the back of this form. Thank you.

FERRIS STATE UNIVERSITY

Questionnaire Supplement **Manufacturing Engineering Technology**

In the following section, each question is to be answered in two parts. For each activity listed, please 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 Technology program should increase, decrease, or maintain the level of content of each activity in the program.

1993 – 1998 Graduates

ACTIVITY	Highly Relevant	Relevant	Somewhat Relevant	Not Relevant	Increase	Keep Same	Decrease
Ability to evaluate work methods	7.7%	84.6%	7.7%		15.4%	53.9%	
Ability to establish time standards	15.4%	53.9%	30.8%			69.2%	7.7%
Ability to estimate product costs related to manufacturing	23.1%	53.9%	23.1%		46.2%	30.8%	
Ability to perform economic evaluation of project	30.8%	38.5%	30.8%		23.1%	46.2%	
Application of statistical process control techniques	38.5%	30.8%	15.4%	15.4%	23.1%	46.2%	7.7%
Application of facilities planning techniques	15.4%	38.5%	38.5%	7.7%		61.5%	15.4%
Ability to perform statistically designed experiments		61.5%	23.1%	15.4%	7.7%	61.5%	7.7%
Automation and systems design	38.5%	38.5%	23.1%		23.1%	53.9%	
Process planning	15.4%	76.9%	7.7%		7.7%	46.2%	
Production and inventory control	15.4%	30.8%	46.2%	7.7%	7.7%	23.1%	23.1%
Use of computer for manufacturing applications	53.9%	30.8%	7.7%	7.7%	46.2%	23.1%	7.7%
Understand production machining processes	38.5%	30.8%	15.4%	15.4%		76.9%	7.7%
Understand production plastics processes	30.8%	46.2%	23.1%		23.1%	53.9%	
Understand production pressworking processes	15.4%	46.2%	38.5%		15.4%	53.9%	7.7%
Proper use and implementation of measurement systems	23.1%	30.8%	30.8%	7.7%		61.5%	15.4%
Technical reports and presentations	46.2%	15.4%	30.8%		23.1%	46.2%	7.7%
Understanding concepts of tool engineering	15.4%	53.9%	30.8%		15.4%	53.9%	
Cutting tools and machinability	7 7%	46.2%	38.5%	7.7%		53.9%	30.8%
High performance tool materials		53.9%	30.8%	7.7%	7.7%	61.5%	7.7%
Jig, fixture design and work holding	30.8%	46.2%	15.4%	7.7%	15.4%	61.5%	
Special tooling and tooling applications	15.4%	46.2%	23.1%	15.4%		76.9%	
Technical electives							
CAD/CAM	30.8%	46.2%	7.7%		23.1%	53.9%	
Electronics	15.4%	53.9%	30.8%		23.1%	38.5%	7.7%
Metallurgy – material science	7.7%	53.9%	30.8%	7.7%	7.7%	46.2%	15.4%
Communication skills	69.2%	23.1%	7.7%		53.9%	23.1%	
Required math level	23.1%	38.5%	23.1%	15.4%	23.1%	46.2%	7.7%
Other elements of your educational experience							
Internship	69.2%	23.1%	7.7%		38.5%	30.8%	7.7%
Plant visits	61.5%	30.8%			69.2%	7.7%	
Guest speakers	30.8%	53.9%	15.4%		38.5%	38.5%	
Facilities to support lab activities	61.5%	30.8%	7.7%		46.2%	30.8%	

Current Work Experience

Please list three job functions related to your current position:

If you have any further comments, please write them on the back of this form. Thank you.

FERRIS STATE UNIVERSITY

Questionnaire Supplement **Manufacturing Engineering Technology**

In the following section, each question is to be answered in two parts. For each activity listed, please 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 Technology program should increase, decrease, or maintain the level of content of each activity in the program.

1999 – 2003 Graduates

ACTIVITY	Highly Relevant	Relevant	Somewhat Relevant	Not Relevant	Increase	Keep Same	Decrease
Ability to evaluate work methods	75%		25%		25%	50%	
Ability to establish time standards	75%		25%		25%	50%	
Ability to estimate product costs related to manufacturing	75%	25%			50%	25%	
Ability to perform economic evaluation of project	50%	50%			50%	25%	
Application of statistical process control techniques	75%			25%	25%	25%	25%
Application of facilities planning techniques				25%	50%		25%
Ability to perform statistically designed experiments	50%	50%	50%			50%	25%
Automation and systems design	50%	25%		25%	50%		25%
Process planning	50%	50%			75%		
Production and inventory control		50%	50%		25%	50%	
Use of computer for manufacturing applications	75%	25%			50%	25%	
Understand production machining processes	25%				50%	25%	
Understand production plastics processes	25%		25%	50%		50%	25%
Understand production pressworking processes	50%	25%		25%	25%	25%	25%
Proper use and implementation of measurement systems	25%	75%				75%	
Technical reports and presentations	25%	75%			25%	50%	
Understanding concepts of tool engineering	50%	50%				75%	
Cutting tools and machinability	50%	50%				75%	
High performance tool materials		50%	25%	25%		75%	
Jig, fixture design and work holding	75%		25%		50%	25%	
Special tooling and tooling applications	50%		50%		25%	50%	
Technical electives							
CAD/CAM	75%	25%				75%	
Electronics	75%					75%	
Metallurgy – material science	25%	50%	25%		25%	25%	25%
Communication skills	100%		25%		25%	50%	
Required math level	25%	75%				75%	
Other elements of your educational experience							
Internship	75%			25%	25%	25%	
Plant visits	25%	75%			25%	50%	
Guest speakers		50%	50%		25%	50%	
Facilities to support lab activities	50%	25%	25%		50%	25%	

Current Work Experience

Please list three job functions related to your current position:

If you have any further comments, please write them on the back of this form. Thank you.

Section 3

Employer Survey

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, telephone, and as situations permitted, by personal visit. A short to-the point survey instrument was used. 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. Alum that received an alumni survey, also received an "Industry Survey" that was to be forwarded to their supervisor. The response was euphemistically speaking, "statistically invalid". Opportunities for brief telephone interviews and personal visits presented themselves during the summer of 2004.

B. SURVEY RESULTS

The response to the mailed survey was abysmal. As of August 31, 2004 only a handful of surveys had been returned. This effort was supplemented with aforementioned telephone conversations and personal visits. Responding companies included:

- PPG Works #23 - Evart, MI
- Federal Screw Works – Big Rapids, MI
- Heath Corp.- Coopersville, MI
- ASIMCO Assembled Camshafts – Grand Haven, MI
- Delphi - Saginaw, MI
- Pilkington – Niles, MI
- General Products – Jackson, MI
- Autocam - Grand Rapids, MI
- ITW Drawform - Zeeland, MI
- UNC-Johnson Technology, Muskegon, MI
- Haworth - Holland, MI
- Haworth – Big Rapids, MI
- Alcoa – Fruitport, MI
- Innotec – Zeeland, MI
- Pridgeon and Clay – Grand Rapids, MI

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 33 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	9	3	1	1	1	1	

2. What percentage have the skills you require?

Table 3-2 contains the responses to Question 2.

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	5	8	2								

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

The following comments were received:

- Experience
- Couldn't comment
- People skills/communication
- Time management is always important
- Business Administration
- Production planning
- Knowledge of machine/automation controls

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. 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. The reluctance by employers to complete these surveys, however rudimentary, may reflect a general attitude of very busy people. Communication with alumni, student interns, and employer representatives, throughout the summer of 2004, indicates that these people in the manufacturing sector are working 6-7 days a week, and often begrudge giving up more than five or ten minutes of their time.

Section 4

Student Evaluations

SECTION 4

STUDENT EVALUATIONS

A. INTRODUCTION

Student Evaluation of Instruction: 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 3rd year, May 2004.
- MFGE students (on campus) at the completion of their 4th year, May 2004.
- MFGE and QET students enrolled in the evening program at the Applied Technology Center in Grand Rapids, May 2004.

B. SURVEY RESULTS

The quantitative results for each group surveyed follow on the attached survey forms.

Results – 3rd Year Students

Program Self Study for Academic Program Review
Manufacturing Engineering Technology
Survey of 3rd-Year Students
Winter 2004

Program Enrolled in: ***100% MFGE*** Age: ***Avg=24***

Sex: ***100% M***

Campus (circle): ***Big Rapids*** Grand Rapids ATC

High School (name & location): ***Various***

High School Graduation Year: ***Avg = 1997***

Transfer Students:

School transferred from: ***85.7% transfer***

Program transferred from: _____

Non-traditional Students:

Company employed at: _____

Job title: _____

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

64.3% Work (where _____)

14.3% Work and school part-time (where _____)

7.1% Enter M.S. degree program (where _____)

_____Enter another B.S. program (where _____)

_____Transfer (where _____)

14.3% Undecided

Results – 3rd Year Students

	Counselor 1	Teacher 2	Parent 3	Friend 4	Advertisement 5	Other (Explain)
1. Who/what helped you decide to come to Ferris State University (check all that apply)	21.4%	50.0%	42.9%	28.6%	7.1%	
2 Who/what helped you decide to enroll in the MFGE program (check all that apply)	28.6%	50.0%	28.6%	14.3%		

	Very Favorable 1	Favorable 2	Neutral 3	Unfavorable 4	Very Unfavorable 5	Other (Explain)
3. Your impression of the Application/Admissions/Financial Aid/Registration Process	7.1%	35.7%	28.6%		28.6%	
4. Your impression of the Manufacturing Engineering Technology program faculty	14.3%	71.4%	14.3%			
5. What is your impression of the laboratory facilities and equipment for your courses	21.4%	50.0%	21.4%		7.1%	
6. What is your impression of the Manufacturing Engineering Technology program course of study	21.4%	57.1%	21.4%			

Use the attached list of proposed courses to answer question 7 & 8	Very Favorable 1	Favorable 2	Neutral 3	Unfavorable 4	Very Unfavorable 5	Other (Explain)
7. If an AAS in Manufacturing Technology was an option would you have preferred it over existing AAS programs that lead into the BS MFGE degree?	7.1%	21.4%	21.4%	14.3%	28.6%	
8. Would you have preferred a 4 year program for the BS MFGE degree (as opposed to a 2 year AAS + 2 year BS MFGE)?		14.3%	35.7%	28.6%	28.6%	

Results – 4th Year Students

Program Self Study for Academic Program Review
Manufacturing Engineering Technology
Survey of 4th-Year Students
Winter 2004

Program Enrolled in: ***100% MFGE*** Age: ***Avg=25.9***

Sex: ***100% M***

Campus (circle): ***Big Rapids*** Grand Rapids ATC

High School (name & location): ***Various***

High School Graduation Year: ***Avg = 1996***

Transfer Students:

School transferred from: ***77.8% transfer***

Program transferred from: _____

Non-traditional Students:

Company employed at: _____

Job title: _____

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

88.9% Work (where _____)

_____Work and school part-time (where _____)

11.1% Enter M.S. degree program (where _____)

_____Enter another B.S. program (where _____)

_____Transfer (where _____)

_____ Undecided

Results – 4th Year Students

	Counselor 1	Teacher 2	Parent 3	Friend 4	Advertisement 5	Other (Explain)
1. Who/what helped you decide to come to Ferris State University (check all that apply)	33.3%	22.2%	22.2%	44.4%		
2 Who/what helped you decide to enroll in the MFGE program (check all that apply)	33.3%	44.4%	11.1%	11.1%	11.1%	

	Very Favorable 1	Favorable 2	Neutral 3	Unfavorable 4	Very Unfavorable 5	Other (Explain)
3. Your impression of the Application/Admissions/Financial Aid/Registration Process		44.4%	33.3%	22.2%		
4. Your impression of the Manufacturing Engineering Technology program faculty	22.2%	44.4%	33.3%			
5. What is your impression of the laboratory facilities and equipment for your courses		33.3%	44.4%	22.2%		
6. What is your impression of the Manufacturing Engineering Technology program course of study	11.1%	55.5%	22.2%		11.1%	

Use the attached list of proposed courses to answer question 7 & 8	Very Favorable 1	Favorable 2	Neutral 3	Unfavorable 4	Very Unfavorable 5	Other (Explain)
7. If an AAS in Manufacturing Technology was an option would you have preferred it over existing AAS programs that lead into the BS MFGE degree?	22.2%	33.3%	22.2%	22.2%		
8. Would you have preferred a 4 year program for the BS MFGE degree (as opposed to a 2 year AAS + 2 year BS MFGE)?	33.3%	33.3%	11.1%	22.2%		

Results- Grand Rapids Students

Program Self Study for Academic Program Review
Manufacturing Engineering Technology
Survey of Grand Rapids Students
Winter 2004

Program Enrolled in: ***78.3% MFGE, 21.7% OET*** Age: ***Avg=31.3***

Sex: ***95.6% M, 4.4%F***

Campus (circle): Big Rapids ***Grand Rapids ATC***

High School (name & location): ***Various***

High School Graduation Year: ***Avg = 1991***

Transfer Students:

School transferred from: ***65.2% transfer***

Program transferred from: _____

Non-traditional Students:

Company employed at: _____

Job title: _____

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

73.9% Work (where _____)

_____Work and school part-time (where _____)

13.0% Enter M.S. degree program (where _____)

8.7% Enter another B.S. program (where _____)

_____Transfer (where _____)

4.4% Undecided

Results- Grand Rapids Students

	Counselor 1	Teacher 2	Parent 3	Friend 4	Advertisement 5	Other (Explain)
1. Who/what helped you decide to come to Ferris State University (check all that apply)	21.7%	21.7%	13.0%	17.4%	17.4%	
2 Who/what helped you decide to enroll in the MFGE program (check all that apply)	43.5%	13.0%	13.0%	4.4%	4.4%	

	Very Favorable 1	Favorable 2	Neutral 3	Unfavorable 4	Very Unfavorable 5	Other (Explain)
3. Your impression of the Application/Admissions/Financial Aid/Registration Process	17.4%	60.1%	17.4%			
4. Your impression of the Manufacturing Engineering Technology program faculty	26.2%	60.1%	13.0%			
5. What is your impression of the laboratory facilities and equipment for your courses	13.0%	52.2%	34.8%			
6. What is your impression of the Manufacturing Engineering Technology program course of study	17.4%	73.9%	4.4%			

Use the attached list of proposed courses to answer question 7 & 8	Very Favorable 1	Favorable 2	Neutral 3	Unfavorable 4	Very Unfavorable 5	Other (Explain)
7. If an AAS in Manufacturing Technology was an option would you have preferred it over existing AAS programs that lead into the BS MFGE degree?	4.4%	8.7%	65.2%	8.7%	4.4%	
8. Would you have preferred a 4 year program for the BS MFGE degree (as opposed to a 2 year AAS + 2 year BS MFGE)?	8.7%	13.0%	47.8%	17.4%	4.4%	

Section 5

Faculty Perceptions

EARNINGS - TOOL AND DIE MAKERS

Median hourly earnings of tool and die makers were $20.54 in 2002. The middle 50 percent earned between $16.33 and $25.64. The lowest 10 percent had earnings of less than $12.97, while the top 10 percent earned more than $30.74. Median hourly earnings in the manufacturing industries employing the largest numbers of tool and die makers in 2002 are shown below.

Motor vehicle parts manufacturing	$25.64
Metalworking machinery manufacturing	20.02
Forging and stamping	19.97
Plastics product manufacturing	19.79

Suggested citation: Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2004-05 Edition*, Tool and Die Makers, on the Internet at **http://www.bls.gov/oco/ocos225.htm** (visited June 02, 2004).

SOURCES OF ADDITIONAL INFORMATION

Precision Machine Products Association, 6700 West Snowville Rd., Brecksville, OH 44141-3292. Internet: **http://www.pmpa.org**

National Tooling and Machining Association, 9300 Livingston Rd., Ft. Washington, MD 20744. Internet: **http://www.ntma.org**

Precision Metalforming Association Educational Foundation, 6363 Oak Tree Blvd., Independence, OH 44131-2500. Internet: **http://www.pmaef.org**

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Labor Market Analysis

MANUFACTURING TOOLING A.A.S. PROGRAM

JOB TITLES OF MANUFACTURING TOOLING TECHNOLOGY GRADUATES

Skilled Trades**.....Tool and Die Maker – Stamping Dies**
Mold Maker – Plastic injection Molds
Tool and Die Maker – Jigs and fixtures
Machinist
Boring Mill Operator
Roll Maker
Layout Technician
Inspection Technician
Electrical Discharge Machine Operator
CMM Operator
CNC Operator
CMM Programmer
CNC Programmer
Set-Up Technician

Technical Engineering.....***Manufacturing Engineer***
Application Engineer
Application Specialist
Design Engineer
Industrial Engineer
Manufacturing Engineer
Mechanical Engineer
Project Engineer
Process Engineer
Product Engineer
Purchasing Engineer
Quality Control Engineer
Robotic Engineer
Tool Assembly Engineer
Tooling Engineer

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Labor Market Analysis

JOB TITLES Continued

***Management*.....Account Manager**
Area Sales Manager
Assembly Supervisor
Cost Analyst
District Manager
General Manager
President
Project Manager
Plant Engineering Supervisor
Plant Manager
Program Manager
Quality Assurance Manager
Tool and Die Department Manager
Vice President
Vice President of Manufacturing

Sales.....***Sales Engineer***
Sales Representative
Technical Sales Representative

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology
Labor Market Analysis

COMPANIES THAT EMPLOY FERRIS STATE UNIVERSITY MANUFACTURING TOOLING GRADUATES

Acatus, MI

Acutex, MI

Aerotech Industries, MI

Aerotek Contract Eng. Services, MI

AIM, MI

Barth & Associates, Inc.

U.S. and International, FL

Beach Mold and Tool, Inc., IN

Bentler Industries, Inc., MI

BF Goodrich Specialty Chemicals, OH

Boos Products Gear and Eng., MI

Bremen Castings, Inc., IN

Brinks Tool & Die, MI

Burr Oak Tool & Gauge Co., MI

Catepillar, Inc., IL

Center Manufacturing, Inc., MI

Chivas Products Ltd., MI

Cincinnati Milacron, OH

COMPANIES THAT EMPLOY FERRIS STATE UNIVERSITY MANUFACTURING TOOLING GRADUATES

Circuit Control Corporation, MI

Claus, MI

Copeland Corporation, OH

Delta Tech Mold Inc., IL

Deroyal Industries, Inc., TN

Drawform, MI

Eaton Technologies Corp., MI

ENTEK Manufacturing Inc., OR

Enterprise Die & Mold Inc., MI

Evans Tool & Engineering, MI

Fabricor Inc., MI

Fawn Industries, MI

GM UAW Local 653 Union Hall, MI

Gordon Engineering, MI

Granby Mold, Inc., MI

Hanson Mold, Inc., MI

Hi-Tech Mold & Engineering, Inc., MI

Holland Wire Products, MI

HRU, Inc. Technical Resources, MI

Ironwood Plastics Inc., MI

K&M Machine-Fabricating, Inc., MI

COMPANIES THAT EMPLOY FERRIS STATE UNIVERSITY MANUFACTURING TOOLING GRADUATES

Knape & Vogt Manuf. Company, MI

Letica Corporation

Liberty Molds, MI

Lippert Components, Inc., MI

Luner Industries, MI

Makino, OH

Manutek, Inc., MI

MC Molds, Inc., MI

McDonnell Douglas Air Transport, OH

Metal Flow Corporation, MI

Michigan Scientific Corp., MI

Mid-West Instrument, MI

Midwest Machine, MI

Midland Industrial, OH

M&J Grinding & Tool Inc., OH

Modern Engineering Inc., MI

Monroe Inc., MI

Multi-Tek Die and Mold, MI

North Adams Mold Inc., MI

Northwest Tool & Die Co, Inc., MI

Nova Tool and Die, MI

Numerical Control Center Inc., MI

COMPANIES THAT EMPLOY FERRIS STATE UNIVERSITY MANUFACTURING TOOLING GRADUATES

Panduit Corporation, IL

Par Molds, MI

Pentavision Plastics, MI

Phillips Plastics Corporation, WI

PMC Machinery Sales, MI

Prestige, MI

Johnson Corporation, MI

Progressive Industries Inc., MI

Proper Mold & Engineering Inc., MI

R & S Tool & Die, MI

Rapid Die & Engineering, Inc., MI

Rapid Die & Engineering Co., MI

Ronningen Research , MI

Ronningen Research & Dev., MI

Royal Oak Products Co., MI

Sacittarius Mold, Inc., S.C.

Sanford Rose Associates, IL
Spec Tool, MI

Superior Tooling Systems, MI

Tannervitz Quality, MI

Tannewhite, MI

Target Mold Corporation, MI

COMPANIES THAT EMPLOY FERRIS STATE UNIVERSITY MANUFACTURING TOOLING GRADUATES

Textron Corporation, MI

Toledo Molding & Die, Inc., OH

Tool Specialties, MO

Tool Specialties Co., MO

Transmatic, MI

Traverse Precision, MI

Tri Bulletin Tri Component Products Corp., NY

Wickman Corporation, MI

Woldring Plastic Mold Technology, MI

X-Rite Incorporated, MI

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Evaluation of Facilities and Equipment – Section 8

Area	Meets Objectives	Limited Objectives	Not Possible to Meet Objectives	Comments or Concerns
Lab Location	X			New Staging area for Pre-Lab training and operations.
Lab Size (Sq. Footage)		X		Machinery too congested for Safety
Electrical Requirements	X			
Ventilation Requirements		X		- Surface grinding equipment ventilation is not adequate. - Smoke entering from the welding lab is a problem. - Noise level too high from welding vent fan.
Media Requirements		X		Multimedia equipment is needed in all lecture/lab areas. **
Lab Comfort Level (Heating & Cooling)		X		Controlled environment needed.
Handicap Access	X			
Tool Crib	X			Maintain the 5S Organizational Operations. Serve more than 300 students a week.
Safety Zones Clearly Marked	X			
Adequate Fire Extinguishers	X			
Exits Clearly Marked	X			
Computer Lab	X			- Need Hardware and Software Upgrades. - Need Reliable computer support. - Need program specific lab for lecture/lab activities. **
Equipment Safety		X		-Safety guarding needed for chips and chip control
CNC Equipment	X			
Faculty Office Computers	X			Hardware Upgrades. **

** Refer to Appendix D, Attachment 3 (Unit Action Plan)

MACHINES IN THE MANUFACTURING TOOLING LAB

Vertical Milling Machines	**22**
Horizontal Milling Machines	**3**
Engine Lathe	**13**
CNC Hurco Vertical Mills	**6**
CNC Lathes	**1**
Surface Grinders	**12**
EDM Ram or Sinker	**1**
EDM Wire	**1**
Band Saws	**2**
Cut Off Saws	**2**
Drill Presses	**5**

Plastic Injection Machine	**1**
Optical Comparator	**3**
CMM	**1**
Stamping Presses	**2**
Tool Pre-Setter	**1**

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Curriculum Evaluation– Section 9

The Manufacturing Tooling Technology curriculum receives input from three distinct areas.

1. The program is reviewed on an annual basis by the faculty, alumni and the Advisory Board to insure industrial relevance. At the direction of the Advisory Board, the Manufacturing Tooling Technology program has been making gradual curriculum changes consistent with Industry standards that are applicable to industry needs.

2. Alumni of the Manufacturing Tooling Technology program were surveyed in 1991, 1994, 1995, 1998, 2001, and 2003.

3. In 2002 the program conducted a nation-wide analysis of occupations related to manufacturing tooling technology. This analysis was used to develop a matrix for evaluating the program curriculum. Currently, program faculty are comparing the curriculum to this matrix in order to validate the curriculum.

Future Curriculum Revisions

1. An alternative delivery method needs to be developed to maintain continuity between lecture and lab content being team taught by different instructors.

At this time the curriculum is sound and no other additional changes are anticipated pending future input.

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Enrollment Trends Over the Past Five Years – Section 10

Enrollment, Recruitment and Retention

A. *Enrollment Trends for the past five years.*

1. Student credit hours/FTE. (99 – 03)

98/99	99/00	00/01	01/02	02/03
364	301	268	250	000

2. Majors (on-campus and off-campus, separately).

98/99	99/00	00/01	01/02	02/03	03/04
57	67	64	55	57	61

See Appendix B, Attachment 1
Student Enrollment Chart

Off Campus Activities On Demand:

MFGT 151 – Metal Stamping Process
Credit Hours: 2 (1 Lecture: 3 Lab) On Demand
None

MFGT 153 – Die Construction and Repair
Credit Hours: 2 (1 Lecture: 3 Lab) On Demand
None

MFGT 251 – Die Tryout
Credit Hours: 2 (1 Lecture: 3 Lab) On Demand
None

MFGT 253 – Die Estimating/Project Management
Credit Hours: 2 (1 Lecture: 3 Lab) On Demand
None

3. Graduates (on-campus)

98/99	99/00	00/01	01/02	02/03	03/04
15	15	22	21	12	16

See Appendix B, Attachment 2
Enrollment/Graduate Comparison Chart

Note: There is currently no off campus degree option.

4. Graduates employability (field of employment, starting salary).

	98/99	99/00	00/01	01/02	02/03
% Placed	100%	100%	100%	100%	100%
Salary	$28,500	$29,500	$29,500	$34,725	$00,000*

Source: Administration Program Review 2002

***Please Note**: The above salaries represent starting income without overtime. Current industry requirements mandate a 54 hour workweek with an average income of $43,200.00 for 2003 MFGT graduates.

5. *Graduates promotions and advancement.*

   Graduates enjoy outstanding career mobility. Alumni are located throughout the United States with the majority remaining in Michigan. Graduates are given advanced placement in many industrial apprenticeship programs.

6. *Program capacity.*

   With current resources, the program can accept 36 freshmen. Targeted theoretical enrollment for the A.A.S. program is 66 students maximum, without adding additional staffing and resources. The current faculty positions are Five (5) full time positions, and one (1) Adjunct position.

7. *Accepts/enrollees ratio.*

   The majority of applicants for the Manufacturing Tooling Technology A.A.S program meet acceptance criteria.
   Acceptance for enrollment must meet the 2.0 grade point requirement; with a minimum of 16 ACT, recommended 19 math score for admittance into the technical sequence.

B. *Recruitment*

1. *Describe recruitment activities in the program and how they are coordinated with those carried out by the College and the University.*

   a. Faculty serve on the following boards.
      1. Industrial Scholarship Committee
      2. Members of the Ferris State Tooling Technologist Association
   b. Faculty communicates with at least 20 high schools per year.
   c. Faculty communicates with a minimum of 3 community colleges per year.
   d. Faculty and Student Body Participate in Autumn Adventure.
   e. Faculty and Student Body Participate in homecoming activities.
   f. Faculty provides recommendations for student scholarships in excess of $41,000 in scholarships annually.

      H & S offers $5000 annually
      Paragon offers $9000 annually
      Metal Flow offers $9,500 annually
      Transmatic offers $15,000 annually
      American Mold Builders Association $2000 annually
      Hurco USA offers $500

   g. Faculty along with the Ferris State Tooling Technologist Association, participate in recruiting activities and presentations to area high schools and technical career centers.

2. *Describe interest in the program, eg, number of applicants compared with program capacity.*

For the 2002-2003 academic year the Manufacturing Tooling Technology Program A.A.S. was less than average for incoming freshmen.
Interest for the program is measured by two methods, first are Ferris State University interest cards distributed by the office of admissions, which provide a student prospect list. Second, student enrollment that is displayed on the QUOTTECMFT, screen 107 FSU-SIS+.

See Appendix B, Attachment 3
QUOTTECMFT Screen Print

The Manufacturing Tooling Technology Program participates in the university articulation program. For the 2003/2004 fall semester, no applications were received.

C. *Retention.*

1. *Are there any identifiable retention problems associated with the program?*
Yes. The loss of students to industry prior to graduation is always a concern.

2. *What efforts are being exerted to resolve retention issues? Assess program achieved in this area.*
The program enjoys one of the highest retention rates on campus because of the academic program course content , and the faculty is commitment to the students and providing solid academic counseling.

3. *Describe activities of program-related student organizations.*
Many students who major in the Manufacturing Tooling Technology Program belong to the Ferris State Tooling Technologist Association. Technical speakers from industry, plant tours, and trips to manufacturing tooling conventions are activities that take place throughout the year.

4. *Describe the involvement of the faculty on student advising.*
Each of the program faculty are assigned student advisees during enrollment. Students meet with faculty a minimum of once per semester to monitor and build a schedule.

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Program Productivity/Cost– Section 11

B. Instructional Resources

1. *Describe, in general, the facilities (classroom, lab, clinic, etc.) and equipment available to the program.*

   The Manufacturing Tooling courses utilize multiple laboratory areas: the major laboratory for hands on course work consisting of metal removal, CNC machining and programming, die construction, and mold building. A computer lab is available to the Manufacturing Tooling students. The computer lab is exclusively designed and maintained by the Manufacturing Tooling Technology program.

2. ***Supplies and expense budget***

   Supplies and expense budget for past five academic years.

98/99	99/00	00/01	01/02	02/03
$38,328*	$25,523*	$28,296*	$38,101*	$32,955*

   * Note amounts are actual funds spent not reflective of formulated budget.

3. *Equipment acquisition budget*

   Equipment acquisition budget for past five academic years.
   General Funds** Voc. Ed. Dollars*.

98/99	99/00	00/01	01/02	02/03
$28,000*	$62,400*/$6,633**	$15,292**	$67,939*	$72,466*

4. *Gifts and Grants*

   Gifts, Grants, and Consignments for past five academic years.

98/99	99/00	00/01	01/02	02/03
$95,447*	$44,857*	$10,729.25*	$55,778.50*	$95,227.20*

   *Includes steel donations, consumable donations, equipment gifts and consignments.

   See Appendix C, Attachment 1
   A list of Donations

5. *Travel budget (faculty and administration, separately)*

   Travel expenditures are covered by multiple sources including: Timme travel grants, Program S&E, and marketing and recruiting dollars.

6. *Professional development, other than travel, budget*

   Professional Development for 2002/2003 was $300 per faculty member.

7. *Library resources*

   Library Resources are appropriate with full access for faculty and students.

C. *Describe faculty activities other than instruction, eg.*

Faculty Activities (Past five years)

1. *Committee involvement: program, department, college, university, state, and national levels.*

Each faculty member serves on department, college, and university committees.

See Appendix C, Attachment 2
Faculty Committee Participation

2. *Professional organizations*

The faculty are actively involved in the Society of Manufacturing Engineers, Fabricating Manufacturing Association, and the National Tool and Machine Association at the chapter, district, and national levels through committee membership and convention attendance. Membership in the Society of Manufacturing Engineers, American Association of Engineering, and the Precision Metal Forming Association.

3. *Publications*

Occasional articles about the program have been published.

4. *Consulting*

All faculty members are actively involved in consulting on a continual basis in part to keep their expertise relevant for the students. Automated and conventional machining training, and engineering activities are typical forms.

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Conclusions – Section 12

Effectiveness of the program.

A. *Curriculum.*

1. *What are the graduation requirements?*
   See attached check sheets. **See Appendix D, Attachment 1 Curriculum Check Sheet**

2. *Include a suggested semester-by-semester sequence of courses to be completed.*
   See attached check sheets. **See Appendix D, Attachment 2 Course Sequence Check Sheet**

3. *Comment on the currency of the curriculum with respect to the present and future expectations from the graduate at the workplace.*
   Please review Employer, Alumni, Advisory Board Survey. **Refer to Section 2, 3, 6 Employer, Alumni, Advisory Board Survey**

B. *Quality of the program.*

1. *In what ways can the quality of the program be demonstrated (accreditation, success rate in licensure exam, recognition by others, ect.)?*
   The Manufacturing Tooling Technology program enjoys one of the best placement rates and highest average starting salary. Many metal forming related manufacturers in Michigan provide support for the program with much of the materials and equipment required.
   Students are awarded advanced standing in companies' apprentice programs, and quantify for more than 50 percent of the required 8000 hours of practical experience and application. Students are also awarded 100 percent credit toward theory and class room requirements.

2. *What approaches are utilized to enhance the quality of instruction?*
   Constant pursuit by the faculty of additional degrees and attendance at workshops, seminars, expositions, and utilization of industrial advisory boards.

3. *How is student performance assessed?*
   Examinations, quizzes, term papers, laboratory projects, reports, oral presentations, and student portfolios.
   Student performance is assessed by pretests for incoming students, and post testing for out going graduates is also administered.

4. *How is the quality of instruction measured?*
   Student Evaluations, Peer Evaluations, Alumni Evaluations and Industrial Advisory Board Evaluations. **Refer to Section 2, 3, 6 Employer, Alumni, Advisory Board Survey**

5. *How are the course contents kept current?*
   Annual Advisory Board program review, industry input, annual alumni surveys, employer feed back and faculty professional development.

6. *How is the success of graduates gauged?*
   Initial employment in their field, salaries, career standing, and annual Alumni surveys.

C. *What are the strengths and weaknesses of the program?*

Advantages

1. A unique program, that covers all aspects of the metal removal, metal forming, and mold making.
2. Very high demand vs. supply of graduates.
3. Strategic asset to the Michigan and Great Lakes regional economy. Autos, appliances, furniture, etc.
4. A very high level of industrial support.
5. Scholarship support from industry.
6. Laboratory time on task results in a competitive advantage.

Disadvantages

1. Facility features limits further expansion of lecture and lab actives.

COLLEGE OF TECHNOLOGY
Manufacturing Tooling Technology

Recommendations – Section 13

Actions taken and future prospects

A. *Assessment of actions taken*

1. *What measures have been taken to correct weaknesses and to emphasize strengths of the program?*

It is anticipated that with new leadership and organization in the College of Technology, a solid program-based financial plan will be implemented. Solicited donations from industry along with the formation of an endowment fund with the goal to become self sufficient.

See Appendix D, Attachment 3
Unit Action Plans

2. *What are the results in response to the measures executed?*

To date, administrative cost reduction and initial recognition of program financial constraints.

B. *Future measures needed to enhance the program.*

1. *What are the environmental factors which pose threats or present opportunities for the program (eg. political, cultural, economic, fiscal, administrative, organizational, curricular, technical, social)?*

a. *What impact will these factors have on the program?*

1. Enrollment
2. Quality of program
3. Impact of the future focus/direction of the program

See Appendix D, Attachment 3
Unit Action Plans

b. *What additional measures should be instituted to enhance the program?*

Adjust yearly budgets to upgrade and/or replace capital equipment.

Because the manufacturing tooling technology curriculum supports eight programs within the college of technology, this program should be considered for possible expansion. The Manufacturing Tooling Technology Program has the potential to further increase in enrollment and produce marketable graduates sought by industry, virtually making the placement and potential worth of the graduates limitless.

Budgeting for the program should be established to include:

- Adequate funding for supplies, expenses and maintenance needs.
- Development of a university / industrial partnership for machine tool capital equipment replacement and upgrades.
- A one time upgrade for MFGT staging and resource area. $36,000

Each of the above should be reviewed and adjusted annually to reflect inflation, enrollment, and technological change. This will insure a state-of-the-art, hands-on, highly regarded machine tool technology program.

A number of possibilities exist for new curriculum initiatives in the Manufacturing Tooling Technology area. These include the development of a four-year BS degree program in tooling engineering technology. Possibilities should be explored for hybrid programs, such as manufacturing tooling and technical drafting and tool design, manufacturing tooling and plastics, manufacturing tooling and manufacturing engineering, and so forth.

Appendix A

Attachment 1: Manufacturing Tooling Technology Resource Utilization Chart.

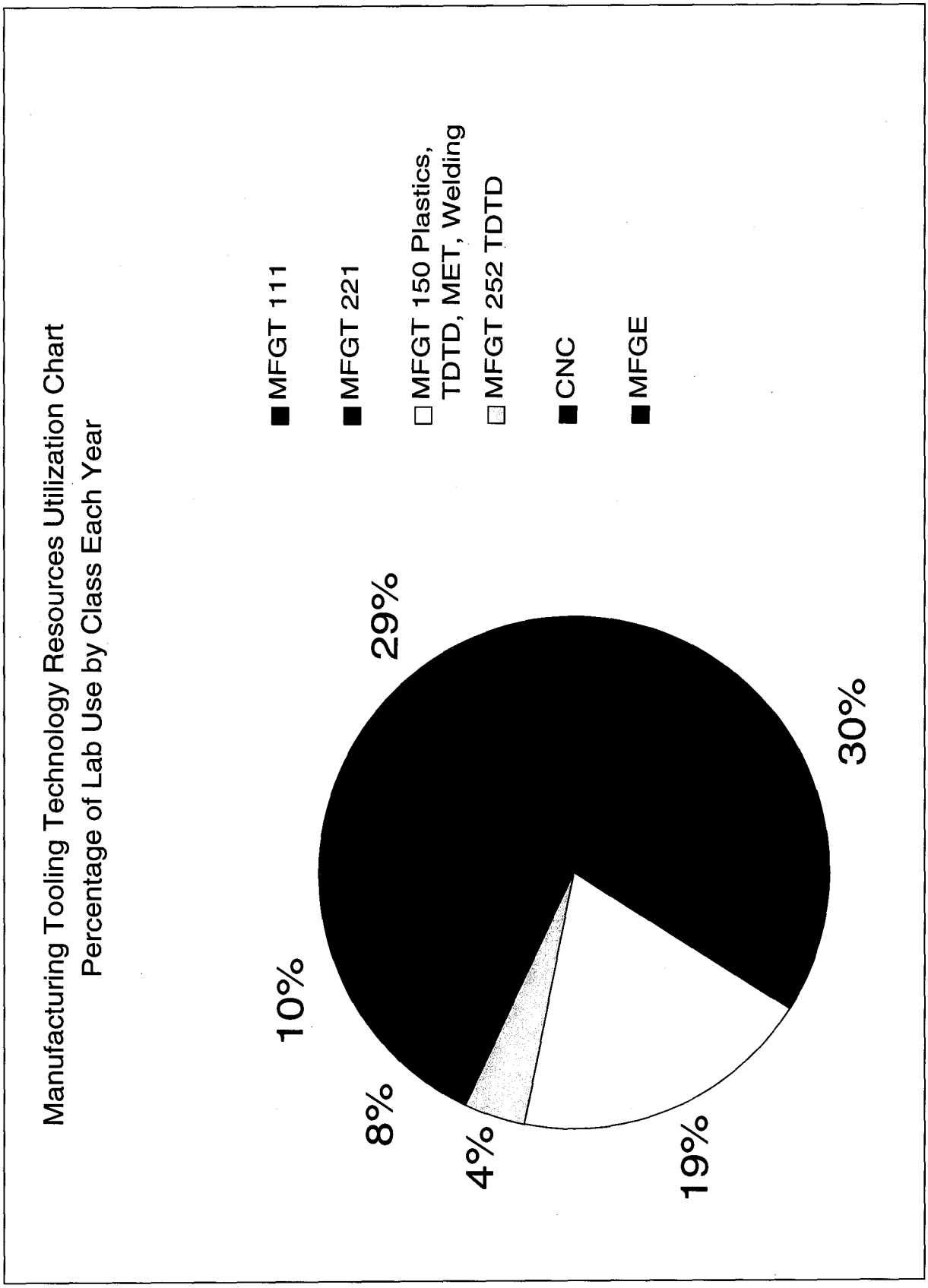
Attachment 2: Department of Labor Statistics Charts.

Attachment 3: Faculty and Staff Resumes.

Attachment 4: Faculty FTE Overloads.

Attachment 5: Advisory Board Membership List.

Attachment 1



Attachment 2

Department of Labor Statistics Chart.

51-4111 Tool and Die Makers

Analyze specifications, lay out metal stock, set up and operate machine tools, and fit and assemble parts to make and repair dies, cutting tools, jigs, fixtures, gauges, and machinists' hand tools.

National estimates for this occupation:

1. Employment estimate and mean wage estimates for this occupation:

Employment	Employment RSE	Mean hourly wage	Mean annual wage	Wage RSE
104,210	1.8 %	$21.10	$43,900	0.6 %

2. Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$13.19	$16.55	$20.67	$25.91	$30.83
Annual Wage	$27,440	$34,420	$42,990	$53,890	$64,140

3. Industry profile for this occupation: Industries with the highest levels of employment in this occupation:

Industry	Employment	Hourly mean wage	Annual mean wage	Employment rank	Wage rank
Metalworking machinery manufacturing	24,660	$20.17	$41,950	1	23
Motor vehicle parts manufacturing	17,330	$25.25	$52,520	2	5
Forging and stamping	6,020	$20.57	$42,780	3	19
Plastics product manufacturing	5,470	$19.99	$41,580	4	27
Machine shops and threaded product mfg.	4,880	$18.53	$38,530	5	43

Attachment 2

Department of Labor Statistics Chart.

51-4111 Tool and Die Makers

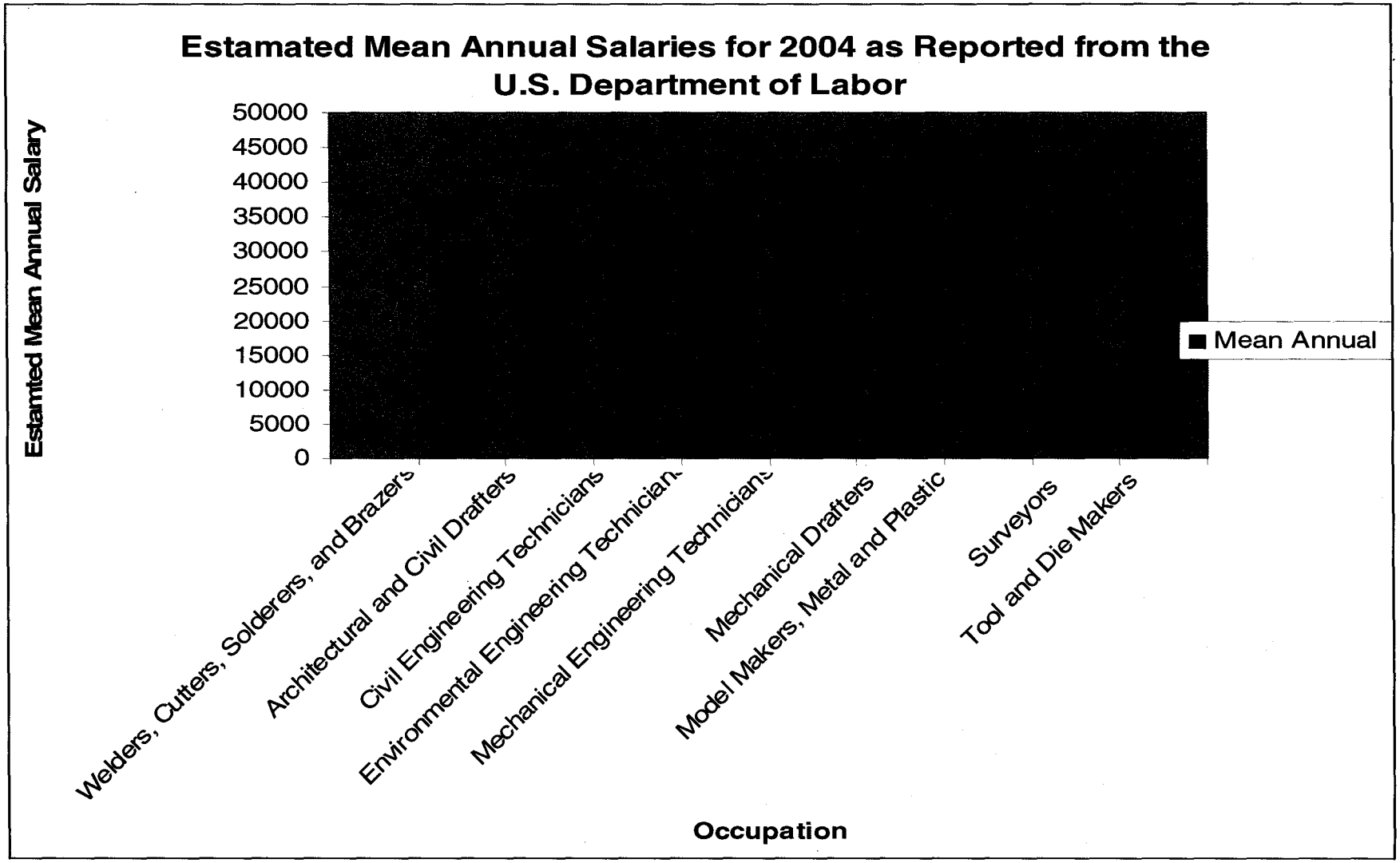
4. State profile for this occupation: States with the highest concentration of workers in this occupation:

State	Employment	Hourly mean wage	Annual mean wage	Percent of State employment	Wage rank within State
Michigan	17,540	$24.74	$51,460	0.404%	178
Indiana	7,260	$22.55	$46,900	0.254%	166
Ohio	12,250	$22.20	$46,170	0.230%	209
Wisconsin	5,230	$20.68	$43,010	0.194%	235
Connecticut	2,950	$22.23	$46,250	0.180%	232

5. Top paying States for this occupation:

State	Employment	Hourly mean wage	Annual mean wage	Percent of State employment	Wage rank within State
Michigan	17,540	$24.74	$51,460	0.404%	178
Oregon	630	$22.88	$47,590	0.041%	169
Indiana	7,260	$22.55	$46,900	0.254%	166
Washington	880	$22.43	$46,650	0.034%	255
Minnesota	2,170	$22.35	$46,480	0.083%	223

Attachment 2



Attachment 2

Department of Labor Statistics Chart.

Department Of Labor Statistics 2004			Wage Estimates		
SOC Code Number	Occupation Title	Employed	Median Hourly	Mean Hourly	Mean Annual
17-1022	Surveyors	51,490	$19.64	$21.06	$43,810
17-3011	Architectural and Civil Drafters	97,800	$18.12	$18.84	$39,190
17-3013	Mechanical Drafters	74,010	$19.96	$20.88	$43,430
17-3022	Civil Engineering Technicians	90,060	$18.30	$18.89	$39,290
17-3025	Environmental Engineering Technicians	17,630	$17.88	$19.01	$39,530
17-3027	Mechanical Engineering Technicians	50,510	$20.14	$20.84	$43,340
51-4061	**Model Makers, Metal and Plastic**	**7,900**	**$20.90**	**$20.98**	**$43,630**
51-4111	**Tool and Die Makers**	**104,210**	**$20.67**	**$21.10**	**$43,900**
51-4121	Welders, Cutters, Solderers, and Brazers	354,300	$14.25	$15.06	$31,330

Attachment 3

Resume:

Tenured/Tenure Track Faculty:
Dennis Finney
Jack Gregory
Doug Chase
Louis J. Nemastil
Dean Krager

One Year Temporary:
N/A

Technician:
Bruce Hammond

Attachment 3

14373 Finney Dr.
Big Rapids, Mi. 49307
Phone (231) 796-7070 or (231) 796-7010

Dennis Finney

Summary of qualifications

1985 – present Ferris State University Big Rapids, Mi.

Professor

- In the past 16 years I have developed and taught beginning and advanced machine tool courses for the university.

Education

1968 – 1972 Ferris State University Big Rapids, Mi.

Associate Degree in Machine Tool

Bachelor of Science in Education

1975 –1979 Eastern Michigan University Ypsilanti, Mi.

Masters of Arts Degree in Industrial Education

Professional experience

- Pre-Employment classes in Machine Tool for Diesel Technology in Grand Rapids, Mich.
- 1996-97 Developed a program (18 hrs. - 261 pages) in (TPM) Total Productivity Maintenance for Big Rapids Components (Hayworth) and presented it to 230 employees.
- May 21-22, 1997 Presented a 2 day seminar "Fundamentals of Machine Tool Technology" in Springfield, Massachusetts EASTEC' 97. Over 220 pictures were scanned in to a power point presentation for this lecture.
- 1998 Developed a forty-hour presentation and student manual on specialized grinding in Power Point for Diesel Corp. in Grand Rapids, Mich.
- Developed a sixty-page book and 40 hour power point presentation for Fiamm Corp. of Cadillac, Mich.
- May – June 1999 Delivered 48 hours of Computer Numerical Control training for Diesel Technology.

References

References on request

Objective

My goal is to develop and deliver training on machine tools (lathe, milling machine and grinding.) Computer Numerical Control and plastic injection mold making are areas I have also developed and trained in.

Douglas G. Chase
1625 Harding Drive
Big Rapids, MI 49307
Home:(231) 796-2245
Work: (231) 591-3058

PRESENT POSITIONS
Associate Professor, Manufacturing Tooling Technology, 2000 - Present
Industrial consultant - Design and construction of stamping dies, special machines, injection and compression molds, variable data gages, industrial robotics and automation.

EDUCATION:
Michigan State University, M. S. Vocational-Technical Education and Administration, 1986.
Ferris State University, B. S. Vocational-Technical Teacher Education, 1978.

EXPERIENCE:
Ferris State University, Big Rapids, MI
Assistant Dean/Department Head, 1996-1999 College of Technology.
Academic Department Head, 1994-1996 Manufacturing Technologies.
Program Director, MFGE Engineered Technologies Department, June 1993-June 1994.
Associate Professor, Manufacturing Tooling Technology, 1978-1993.
Advanced courses in automation, stamping and forming dies, injection and compression molds, variable data gage design and construction, and industrial robotics.

Owner and Manager, Quick Cut Tool & Manufacturing, Big Rapids, MI 1985 –1998.
Prototypes, molds, stamping and forming dies, special machine building, variable data design and industrial consulting.

Reed City Tool and Die, Reed City, MI, 1976-1978
Injection mold maker.

Big Rapids Machine and Assembly, Big Rapids, MI, 1975-1976.
Toolmaker in special machine construction and prototype division.

Proctor and Gamble Corporation, Cheboygan, MI, 1972-1976.
Toolmaker in special machine construction and prototype division.

Activities:
Hockey Coach, approximately 25 years experience.
Master Level Coach, USA Hockey. Coached Division II ACHA National Championship, 1994.
Number Three National Ranking 2000.
Enjoy working with youth activities in a family setting.
Coach sons' and daughter's soccer, baseball, and hockey leagues.
Past Faculty Advisor, Society of Manufacturing Engineers Student Chapter.
Past Vice President, Big Rapids Junior Hockey Assoc. (BRJHA).

REFERENCES: Upon request.

Attachment 3

Louis J. Nemastil

113 Park Avenue
P.O. Box 168
Hesperia, MI 49421
(231) 854-5015
neme@triton.net

CAREER OBJECTIVE

University-level educator with comprehensive knowledge and experience in the Manufacturing Tooling Field that includes: engineering management, tooling operations, tool design, die design, automation and systems development, stamping operations, steel fabrication, engineering and manufacturing operations, manufacturing processing including roll forming methods and operations.

PROFESSIONAL PROFILE

Certified Vocational Educator with a B.S. in trade/Technical Education, with a MS in Career / Technical Education. Offers 21 years of comprehensive engineering and administrative experience in the manufacturing tooling field, with emphasis on the design and development of progressive dies, sheet metal operations, statistical process control, design of experiment, manufacturing lines, automation and fixture design. Effective tooling and jig/fixture construction. Well-developed interpersonal and communication skills enhanced by excellent technical abilities and well versed in the areas of industrial management and operations.

EDUCATION

M.S., Career and Technical Education, Ferris State University, Big Rapids, Michigan

B.S., Trade/Technical Education, Ferris State University, Big Rapids, Michigan

A.A.S., Machine Tool, Ferris State University, Big Rapids, Michigan

Certified Vocational Education Instructor, Provisional Certification.
Certified for grades 9-12, Vocational Training, Provisional Certification.
Certified for grades 7-8 all subjects, Provisional Certification

Certified Tool & Die Maker, U.S. Department of Labor, Bureau of Apprenticeship & Training

EMPLOYMENT HISTORY

Ferris State University, Big Rapids, Michigan ***1997-Present***

Associate educator of for the following courses: MFGT-211 Metal Forming Die Construction; MFGT-112 Machinery Handbook and Calculations. MFGT-121 Metal Forming Die Construction; MFGT-121 Metal Removal II; MFGT-252 Advanced Machine Tools. Requires extensive content research and preparation; design curricula and create course modules and lessons for lecture and lab activities; effective teaching methods; team coordination; strong interpersonal and communication skills; solid decision making and problem-resolution skills; and constant updating of knowledge and technical skills.

Louis Nemastil, Design and Training Services, Hesperia, Michigan 1995-Present
Design and development of tooling systems, manufacturing systems, engineering operations, and training programs. Services are directed toward engineering and training activities, which include: tool design, tool processing, tool manufacturing, cost estimating, and program development. Clients consist of business owners, engineers, managers, team leaders, supervisors, and manufacturing facility personnel. Tool Design and training services are custom designed to enhance customer efficiency and productivity, including the ability to assess client needs, create course modules and lessons designed to meet individual customer requirements. Implementation of Microsoft Office software programs, (Word, Excel, PowerPoint), and strong English communication and customer service skills. Technical training and manufacturing plant experience.

Superior Metal Products, Corporate Tooling Division, Spring Lake, Michigan 1984-97
Design engineer, engineering administrator, and production coordinator with complete engineering capabilities. Responsible and accountable for ensuring the smooth day-to-day operations in all areas of engineering for twelve corporate divisions, including prototype development, manufacturing systems planning, troubleshooting, budgeting, quoting, and cost estimating. Emphasis on the design and development, from concept to implementation, of complete manufacturing lines using proper engineering methods and standards. Participated in Design of Experiments for product development and processes. Key player in initiating and maintaining corporate computer system. Functions as consultant and troubleshooting for twelve corporate divisions nationwide. Scope of responsibility and accountability increased greatly in final years.

Bendix/Warner & Swasey Research Division, Solon, Ohio 1981-84
Manufacturing, design, and testing of all prototype tooling equipment for machine tool operations.

Reed City Tool & Die, Reed City, Michigan 1980-81
Tool & Die Construction for plastic injection molding systems. Implemented theoretical knowledge into practical application.

IEM Corporation, Roger Heights, Michigan 1980
Tooling Operations and Machining, Fabrication.

Tutorial Services, Ferris State University, Big Rapids, Michigan 1979-80
Tutor for advanced manufacturing tooling students, and lab assistant for manufacturing department.

ACCOMPLISHMENTS AND AFFILIATIONS

- Graduate Studies; Highest Distinction; Ferris State University, Big Rapids, Michigan.
- President, St. Michael's School Board Grand Rapids Diocese affiliation since 1988. Responsible for setting agendas; conducting meetings; setting budgets; coordinating and implementing programs and policies; motivating and encouraging in a proactive management style.
- Mechanical Advisor for Science Olympia, St. Michael School, Fremont, Michigan.
- Administration of grant monies, St Michael School, Fremont Michigan.
- Established educational program involving business skills directed toward enhancing math and science curriculum. Grant monies obtained through the Fremont area foundation, Fremont Michigan.
- Served on the Curriculum Committee for the Manufacturing Department, Ferris State University, Big Rapids, Michigan.
- Chair person for the Annual Giving Campaign, Saint Michael School, Fremont Michigan.
- Served on the Associate Deans Search Committee for the College of Technology, Ferris State University, Big Rapids, Michigan.
- Served on the Conduct Review Committee: (CRC) in Judicial Services. Served as representative for the College of Technology, Ferris State University, Big Rapids, Michigan.
- Author of reorganization plan for the Grand Rapids Diocese, Grand Rapids, Michigan. Implementation of School organizational and operational plans for the 2001-2002 school year.

Attachment 3

Dean Krager

Industrial Work Experience

Manufacturing Engineer
Newcor, Rochester Gear- Clifford, MI
March 1998 - August 1999

- Managed the development and launch of new manufacturing cells.
- Researched, ordered, ran-off, and implemented manufacturing equipment including: machining, gaging, and material handling equipment.
- Performed tool testing for high-precision machining operations.
- Designed and sourced special workholding fixtures and custom indexable tools.
- Evaluated current processes and established long-term goals.
- Researched, developed, and implemented new processes including: hard turning and dry machining.

Manufacturing Engineer
Orbital Fluid Technologies/Synerject- Saginaw, MI
June 1995 - March 1998

- Reviewed product designs for manufacturability and specified process prints.
- Developed process documentation including: process prints, flow charts, setup sheets, control plans, and FMEA's.
- Researched, ordered, ran-off and implemented manufacturing equipment including: machining, gaging, assembly, and test equipment.
- Evaluated future product designs and specified manufacturing requirements including: processes, equipment, capital, floor space, and personnel requirements.

Machinist/Tool Builder
R&S Tool & Die- Caro, MI
May - September, 1994

- Machined and inspected close-tolerance die details and special gages.
- Manufactured prototype parts from a wide variety of materials.
- Produced fixture assemblies and assisted in building special machines.

Tool Designer/Tool Builder
Thumb Group, Gemini Plastics & Lyntex Manufacturing- Ubly, MI
May - September, 1991, 1992, & 1993

- Designed and assisted in building injection molds, blow molds, and fabrication dies.
- Developed gaging and fixturing prints from 3-D CAD models.
- Evaluated, debugged, and programmed an NC replicator.

Mechanical Draftsman
Nortec Precision Plastics- Bad Axe, MI
September 1988 - June 1989

- Developed layout prints for quality assurance.
- Designed gages and CMM fixtures for injection molded parts.

Dean Krager

Academic Work Experience

Assistant Professor
Ferris State University: College of Technology- Big Rapids, MI
August 1999 - Present

- Teaching: Machine Tool Operations I, Machine Tool Operations II, Basic Machine Tools, Advanced Machine Tools, and Freshman Seminar courses.
- Developing new course materials for all classes.
- Contributing to the research and development of program curricula.
- Advising the "Ferris State Tooling Technologists Association" student organization.
- Overseeing the "Skills USA" activities for Manufacturing Tooling students.
- Serving on the Manufacturing Department Curriculum Committee, College of Technology Scholarship Review Committee, and Dean's Advisory Committee.

Technical Instructor

In addition to the hands-on industrial work experience previously listed, a combination of the following instructional work experience was part of both Manufacturing Engineer positions:

- Taught Basic Machining and Process Documentation classes to new production operators.
- Provided update training to experienced operators and maintenance staff when implementing new equipment and tooling.
- Taught G-code programming to new manufacturing technicians.

Technical Instructor
Ferris State University: College of Technology- Big Rapids, MI
September 1994 - May 1995

- Taught Introduction to CAD, Basic Machine Tools, and Advanced Machine Tools.
- Developed all quizzes, tests, and final exams for all courses.
- Compiled academic warnings and grades.
- Setup, evaluated, and integrated a new wire EDM programming package.
- Rewrote an NC post-processor to correspond with a wire EDM.

Student Teacher
Wexford Missaukee Technical Center- Cadillac, MI
March - May 1993

- Taught Mechanical Drafting and related topics.
- Provided group and individualized instruction for a combination of traditional and non-traditional students.
- Assisted in the development of new instructional materials.
- Compiled student evaluations and met with students parents during parent-teacher conferences.

Dean Krager

Education and Training

Western Michigan University

Currently pursuing a "Quality Management in Education" certificate.

Ferris State University

M.S.- Career and Technical Education, May 2003.
B.S.- Technical Education, May 1993.
A.A.S.- Manufacturing Tooling, May 1995.
A.A.S.- Technical Drafting/Tool Design, May 1991.
Related Coursework: Mold, Die, and Fixture Design; Part Processing; Metallurgy; Kinematics; Statics and Strengths of Materials; Mold, Die, and Fixture Building; numerous CAD classes; and several CNC programming classes.

Huron Area Technical Center

Certificate of Completion- 2 Year Drafting Program, May 1989.
Related Coursework: Geometric Dimensioning & Tolerancing and Autocad.

Company Sponsored Training

Introduction to Team Building (Siemens Automotive)
Principles of Leak Testing (Cincinnati Leak Test Systems)

Accomplishments

Granted a $3,950 "Ferris Exceptional Merit Grant" April, 2004.
Led MFGT students to place at the top of the "2003 Skills USA Precision Machining Competitions."
Successfully developed and launched a hard-turn job for Ford Motor Company.
Selected to represent Rochester Gear on Newcor's Corporate Advanced Manufacturing Team.

Related Organizations

Society of Manufacturing Engineers.....	Member
Ferris State Tooling Technologists Association....	Advisor
Huron Area Technical Center (Drafting Program).	Advisory Board Member

SECTION 5

FACULTY PERCEPTIONS

A. INTRODUCTION

Faculty perceptions: 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.

Faculty perceptions were surveyed as 3 separate sub-groups as follows:

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

The survey instruments are attached.

B. SURVEY RESPONSES

1. MFGE Faculty

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 are 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.

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 cost of administration for 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:

- Faculty tended to agree that MFGE and MATL coursework met their program objectives and student goals.
- 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. meets their student needs with respect to time, delivery, and number of sections offered

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:

Section 6

Industrial Advisory Board Perceptions

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. They meet with MFGE program faculty and administrators on an annual basis. Current board membership is attached.

B. SURVEY AND RESULTS

Results are included on the survey instrument that was used.

Manufacturing Engineering Technology
Advisory Board List
March 4, 2003

Tim Bublitz
Project Engineer
Bradford Company
13500 Quincy Street
PO Box 1199
Holland, MI 49422-1199
Phone: 616 399 3000
FAX: 616 399 3939
Email: tim.bublitz@bradfordcompany.com

Stephanie Leonardos
President
Amerikam
1337 Judd Avenue SW
Grand Rapids, MI 49509
Phone: 616 243 5833

Mark Herman
Manufacturing Engineer
Acutex, Inc.
2001 Peach Street
Whitehall, MI 49461
Phone: 231 894 3200
FAX: 231 894 3255
Email: mherman@acutex.net

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

Bill Todd
Michigan Rebuild & Automation
921 Anderson Rd.
Litchfield, MI 49252
Phone: 517 542 6000
FAX: 517 542 6003
Email: btodd@mraweb.com

Scott Hilty
Sytems Engineer
Rapistan Systems
38755 Hills Tech Drive
Farmington Hills, MI 48331
Phone: 248 848 9460, Ext. 256
Email: scott.hilty@rapistan.com

Tim Berg
Vice President of Operations
Tool North
2475 N. Aeropark Ct.
Traverse City, MI 49686
Phone: 231 941 1150
FAX: 231 941 4120
ail: tberg@toolnorth.com

Robert McFalls
Director of Technical Resources
GEAE
Johnson Technology
2034 Latimer Drive
Muskegon, MI 49442
Phone: 616 777 7433
Email:
robert.mcfalls@ae.ge.com

Bill Conley
Operations Manager
ASQ, CQE
Big Rapids Products
1313 Maple Street
Big Rapids, MI 49307
Phone: 231 796 3593, ext. 3022
FAX: 231 796 9066
Email: billc@brproducts.com

Tim Proos
Manager
Steelcase Fixture & Machine
Mail Code: FM
901 44th Street SE
Grand Rapids, MI 49508
Phone: 616 246 9054
Email: tproos@steelcase.com

Dave Westphal
Superintendent of Operations
Plant #4
Delphi Saginaw Steering
Systems
World Headquarters
3900 Holland Road
Saginaw, MI 48601-9494
Phone: 517 757 0155
FAX: 517 757 4792
Email:
dave.westphal@delphiauto.com
Beeper: 517 920 2213

Joe Nowicki
2109 Blue Bell Way NW
Grand Rapids, MI 49504
Phone: Home: 616 791 6078
FAX: 616 791 6441
Email: joenow1221@aol.com
Representing: Dienetics, Laser
Dynamics, Troy Tech Services

Jay Doda
Program Manager
Toyota Business Unit
Johnson Controls, Inc.
915 E. 32nd St.
Holland, MI 49423
Phone: 616 394 2484
FAX: 616 394 8000
Email: Jay.W.Doda@jci.com
Cell phone: 616 240 4005

Jamie Pritchard
Environmental & Facilities Engineer
Mark IV Automotive
600 DeKraft
Big Rapids, MI 49307
Phone: 231 796 2691, ext. 229

Jim Dunn
Manufacturing and Quality Manager
Big Rapids Components
A Haworth Company
300 N. Bronson
Big Rapids, MI 49307
Phone: 231 796 1400

Dennis Hawver
CMfgT, Engineering Team Leader
GHSP
1250 South Beechtree Street
Grand Haven, MI 49417
Phone: 616 847 7461
FAX: 616 847 7424

Mark Curtis
Dean
College of Technology and Applied Sciences
Northern Michigan University
DJ Jacobetti Center, Room 202
1401 Presque Isle Avenue
Marquette, MI 49855
Phone: 906 227 2068
Email: mcurtis@nmu.edu

Peter Heimdahl
Ph.D.
Professor / Associate Dean
University of Wisconsin - Stout
280C Technology Wing - Jarvis Hall
Menomonie, WI 54751
Phone: 715 232 1133
Email: heimdahlp@uwstout.edu

Robert Wygant
Ph.D.
Industrial and Manufacturing Engineering
Western Michigan University
2070 Kohrman Hall
Kalamazoo, MI 49008-5336
Phone: 269 777 0593
Email: bob.wygant@wmich.edu

INDUSTRY ADVISORY BOARD PERCEPTIONS

MANUFACTURING ENGINEERING TECHNOLOGY

SUMMER 2004

Please indicate your response by checking the appropriate box.

		Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**
1.	The Manufacturing Engineering Technology Program provides education and training essential to many Michigan industries	75%	25%		
2.	The Manufacturing Engineering Technology program provides skills useful to your company.	75%	16.7%		
3.	Your company would hire a Manufacturing Engineering Technology program graduate.	66.7%	25%		
4.	The program curriculum is appropriate to industry needs.	75%	25%		
5.	The program could be strengthened by building more lab experiences into the curriculum.	16.7%	50%	16.7%	
6.	ABET certification should be pursued provided that the core curriculum is not compromised.	16.7%	50%	16.7%	
7.	A master's degree program at Ferris State would fulfill the need for advanced studies in Manufacturing Engineering.	41.7%	58.3%		
8.	The MFGE program should create it's own 2-year feeder program	50%	33.3%	16.7%	

COMMENTS:

Please use the enclosed envelope to return this document by August 20, 2004

FERRIS STATE UNIVERSITY

College of Technology

Manufacturing Engineering Technology

August 4, 2004

Manufacturing Engineering Technology, Advisory Board Member/Employer

Since the 1980's, regular academic program review has come to be seen as an essential part of curricular and institutional planning in higher education. Programs at Ferris State University with external accrediting agencies have always had to produce self-study reports periodically. The 1987 North Central Association site visit team mandated that the institution develop a program review process for all academic programs at the University.

The goal of program review is to insure that the academic programs of the University achieve and maintain the highest possible standards of academic excellence. Based on a schedule that spans six years, every academic program will have the opportunity to examine itself using a variety of survey instruments and other measures. The resultant self-study will permit the program, department, college, Division of Academic Affairs, and the University to make informed decisions about curricular issues and resource allocations.

During the 2004-2005 academic year, the Manufacturing Engineering Technology program at Ferris will be reviewed. A vital part of the review process will be your professional input. Enclosed find a survey that we request you complete. Please return the completed survey with your written comments in the addressed stamped envelope by August 20, 2004. The survey should take 15-20 minutes to complete, Individual responses are confidential but the overall responses will be analyzed to help determine the status, trend, and future of the Manufacturing Engineering Technology program at Ferris. A program Curriculum Guide Sheet and set of course descriptions are enclosed to assist you. Note that item 8 refers to the feasibility of creating a 2-year on-campus feeder program. Historically the MFGE program has recruited students from existing technical associate degree programs on campus, and from 2-year community colleges. While that approach would still be maintained, we are proposing to create an additional feeder (AAS in Manufacturing Technology), that would utilize existing courses from existing on-campus feeder programs. Students would be able to select a variety of courses/options from Machine Tool, Welding, Cad Drafting, Mechanical Engineering Tech., Rubber and Plastics Technology from which to fashion a technical associate degree that is broader based than existing 2-year offerings..

Your participation in this survey is critical in order for us to get an accurate review of our Manufacturing Engineering Technology program. On behalf of the students and faculty of the Manufacturing Engineering Technology program, we thank you for your time and input.

Sincerely,

Gary L. Ovans, Professor and Manufacturing Department Chair

Encl.

MANUFACTURING DEPARTMENT
WELDING ENGINEERING TECHNOLOGY DEPARTMENT
COLLEGE OF TECHNOLOGY
915 Campus Drive, SWN 108, Big Rapids, MI 49307-2291
Phone 231 591-2511 Fax 231 591-2407

Michigan Rebuild & Automation, Inc.

921 Anderson Rd.
Litchfield, MI 49252
Phone: 517-542-6000
Fax: 517-542-6003

August 9, 2004

To-

Manufacturing and Welding Engineering Technology Department
Ferris State University
Swan 107
915 Campus Drive
Big Rapids, MI 49307-2291
Attn- Gary Ovans

From-

William Todd

Dear Gary,

I am receipt of your letter and survey form. I have enclosed the completed form with this letter; however I feel some explanation and observations are in order.

The changing environment of industry in this country has taken some of the creative thinking in the area of manufacturing out of play. It appears to me that a well stocked 'Rolodex' is a preferred solution for many of the young manufacturing engineers. I see a tremendous loss in the creative side of manufacturing engineering within some of the medium to larger companies. The prevailing attitude in so many cases seems to be one of 'Buy new and let the vendor take care of the programming and tooling for me – turnkey the job'. To battle this trend I feel that Ferris needs to keep challenging the young minds to be creative. I feel you have been doing the best job in this area of all of the schools within the sphere of my knowledge, but I also feel that your guard cannot be let down. This may be the opportunity to offer more lab experiences by giving the student very little to work with and make the creativeness and ingenuity go to work.

I think you are probably aware that I have not been a supporter of ABET. I still feel that it takes a bite out of the muscle of the program. Your uniqueness has been one of your major strengths. The only way I would offer any support to ABET would be on a 2+3 arrangement or possibly a 1+3 if the necessary pre-requisites could be fit into the first year of the program. I realize that is would be a tremendous expense to add a third year to the program. It would be a tough sell to the University; however the strength added could be quite extreme.

In reviewing the curriculum I noted that WELD416 & PLTS325 are requirements. These areas are important to have a basic understanding of, but I feel that there is a hole that needs to be looked at. I do not find any requirement for electrical study. As we drive further into the computer controlled age and the levels of automation that are now employed it is imperative that the student get exposure to electrical service (switchgear, buss duct loadings, capacities, etc) and computer based controls and devices (CNC, PLC, standard and proximity type switches, photo eyes, light curtains, cameras, etc.). I realize that the goal is not to make experts in this area, but the new employee needs to have at least a conversational knowledge of the subject.

The subject of a Master's program caught me somewhat off guard. I realize that my schedule prevented my attendance to the last couple of meetings where this may have been addressed. I would like to see any proposal that may be on the table as to the length of study, content, qualifications, staffing, etc... I have to reserve any opinion in this area due to my lack of understanding at this point.

As usual, it is a pleasure to converse with you even though in this case it is not on a face to face arrangement. I do hope that all is well within the Big Rapids area. If any of the comments I have noted are of any concern or deserve any further communication please do not hesitate to contact me. Again I hope this finds you and all well. Keep up the good work.

Sincerely,

Bill

Bill Todd

Section 7

Labor Market Analysis

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 of 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 ensure 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 12 percent of all employment in the U.S. economy and constitutes 14% of the Gross Domestic Product. Manufacturing, if considered alone, would rank as the fifth largest economy in the world.

Employment Projections data (U.S. Dept. of Labor) indicate that manufacturing employment is expected to decrease by 1.0 percent over the 2002-2012 period. This is attributed, primarily, by the impact of increases in labor productivity. Labor productivity grew by 5.1 percent from 2002-2003, and by 3.8% in the first quarter of 2004.

Manufacturing Engineers are central to more efficient, higher quality production, and the resultant improvements in labor productivity. 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, and location. New graduate salaries in 2002 averaged $52,411. Nationally the median earnings for Manufacturing Engineers exceed $60,000 with senior management earnings in the field of over $100,000.

Michigan Manufacturing Careers Campaign

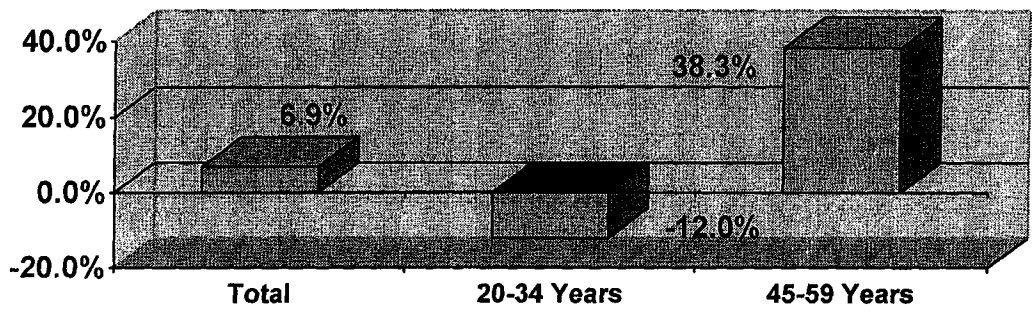
A Proposal to the Michigan Department of Labor and Economic Growth

The Nations' economy continues at high unemployment with manufacturing job losses the most severe among all business and industry sectors. Governor Granholm announces a fall summit focused on preserving the Nation's manufacturing jobs and urges all governors to join her fight to "save" manufacturing. Yet others speak of a shortage of qualified applicants for manufacturing work and express concern that too few people will be interested in the industrial sector in the future. Still others claim that Michigan and the Nation face a serious skill shortage, or talent crisis, in the not too distant future. How can both perspectives to be true?

It is possible for both the "surplus" and "shortage" viewpoints to be valid during 2003. The economic slowdown, high unemployment and persistent employment declines in manufacturing of the present are well documented. However, the "crisis" concerns come from those who see powerful demographic trends affecting the number of workers available in the state combining with an ongoing image problem that will reduce the proportion of talented Michiganians willing to work in manufacturing-related fields. As a consequence, it is likely that manufacturing employers will have difficulty securing talented employees at all levels of occupations and skills.

One factor arousing concerns is the tremendous demographic shift away from younger workers to older workers. Between 1990 and 2000, the population aged 20-34 years of age fell by nearly 275,000 while the population 45-59 years of age grew by almost 515,000. As the chart below demonstrates, Michigan's overall population growth of nearly 7% during 1990-2000 masks the extraordinary shift that is occurring. This change will continue through 2015 and beyond with Michigan unable to replace older workers who are retiring with younger workers unless in-migration patterns change dramatically and more people move here than leave.

Older Workers Growing,
Younger Workers Declining in Michigan
1990 and 2000 Census



A closer examination of the demographics in manufacturing, training supply and employer assessments of the labor market reinforce the idea of a "talent crisis" in manufacturing:

- An analysis of the age demographics of the manufacturing work force by the Michigan Department of Career Development (*Michigan Manufacturing Study - The Status and Future of the Manufacturing Workforce in Michigan*") indicates that the manufacturing sector will need to hire approximately 200,000 workers over the next decade to replace existing workers who retire during this period. Replacement demand will extend across the occupational spectrum including managerial and professional, engineering and information technology, skilled trades, and operatives and assemblers. A comparison of the skilled production supply and demand data suggests that employment needs are not being fully served by current apprentice and formal education programs.

- According to the National Association of Manufacturers (NAM), eighty percent of large and small manufacturers reported a "moderate to serious" shortage of qualified job applicants during the most recent recession (April 2003).

- According to the press release (April 2003) for *Keeping America Competitive: How a Talent Shortage Threatens U.S. Manufacturing"* by NAM - "The widespread loss of manufacturing jobs over the past two years has concealed a looming shortage of highly skilled employees that could undercut manufacturing competitiveness and weaken the U.S. economy."

It is impossible to maintain a highly-skilled manufacturing workforce if the predominant image of the sector is negative. Young people will avoid work in manufacturing and enrollment in college and technical preparation programs that prepare them to work in the goods-producing sector if it is not highly regarded. Unfortunately, this negative view of the sector is widespread among young people, college students, parents, teachers, public officials and even current manufacturing employees. All of these groups continue to hold on to the old stereotype of manufacturing as only assembly line work and as a sector in decline. Especially troubling is the near unanimity among students that manufacturing careers do not offer what they want out of a career. According to a survey from the National Association of Manufacturers, the Manufacturing Institute and Deloitte & Touche:

> When asked to describe the images associated with a career in manufacturing, student respondents offered phrases such as "serving a life sentence," being "on a chain gang" or "slave to the line," or even being a "robot."
>
> Respondents indicated that they felt that a career in manufacturing was "not ambitious," "settling for less" and certainly "not something you dream about."

The same survey noted that parents and teachers have similarly dark perceptions about manufacturing:

> Suggesting that it is "dark and dirty," "hard physical" or "manual labor" offering "poor pay." Others called a career in manufacturing "outdated" and only appropriate for the past generation." Many educators viewed manufacturing as "not being a growth area in the U.S. economy" and "not something you go to college for." They therefore did not recommend it as a career choice.

> One K-8 educator in Alabama suggested, "The manufacturing jobs I've seen, you don't need a fourth-grade education for. I wouldn't recommend a career in manufacturing to any of these college-bound kids."

Aside from a negative view, the survey indicated that there is misunderstanding about what manufacturing is:

> As a college student in New Jersey said, "Manufacturing doesn't sound prestigious; I guess that is a big part of it. But if you could design the product, or have input as a mechanical engineer changing the way that cars are made, that would be cool."

Finally, the MMA and the Michigan Department of Career Development (MDCD) convened a small group of manufacturing representatives and state government officials in June of 2002 to react to the MDCD study entitled *The Michigan Manufacturing Study - The Status and Future of the Manufacturing Workforce in Michigan.* Although there was uncertainty about outright skill shortages in Michigan because of the economic slowdown, there was consensus about the image of manufacturing. The general consensus of the group was:

- ✓ Young people tend to make career decisions based on their interests, not on realistic employment opportunities or high pay;
- ✓ The "dirty work" and "rust belt" image of manufacturing is unfounded in light of how the work has dramatically changed;
- ✓ Any image campaign must be done right and conducted over an extended period; and
- ✓ Manufacturing needs to be "branded" in a positive and appealing manner.

Goals

Through a partnership comprised of Michigan Department of Labor and Economic Growth (MDLEG), the Michigan Virtual University and the Michigan Manufacturers Association, begin to transform the image of careers in manufacturing from one with a negative, unappealing reputation to a "career of choice" status by:

I. Establishing a Manufacturing Career Center Web site addressing the career development needs of students, young workers, parents and educators;

II. Implementing an image reshaping outreach effort to students, young workers, parents and educators involving a limited marketing campaign, expansion of Michigan Manufacturing Week into a year-round event, and establishment of a Manufacturing Academy at Ferris State University; and

III. Exploring collaboration with the National Association of Manufactures (NAM) on their proposed national image-building campaign, including potential linkages such as

expansion of the Michigan Manufacturing Career Center Web site and piloting a marketing campaign in one local labor market.

I. Establish a Manufacturing Career Center Web site addressing the career development needs of young adults, parents and educators.

MVU proposes development of a hybrid Web site based on our expertise and experience with similar projects. The Manufacturing Career Center would allow users to create, modify and update career plans with rich industry specific career, training and news information. The Career Center would be a Web site that:

- Is designed to portray manufacturing in a positive manner
- Promotes the appealing lifestyle of work in manufacturing
- Uses an enticing "cluster" name other than manufacturing (e.g. engineering and science) to help combat the negative connotations of "manufacturing"
- Fully informs students, parents, educators and prospective young workers of the full range of careers available in manufacturing and how to prepare for and access them
- Encourages pursuit of math and science coursework as well as lifelong learning/skill upgrading
- Provides a career exploration tool set so young people may determine if manufacturing matches their personal dispositions and career aspirations
- Uses innovative technology to deliver information
- Provides the means for young adults to develop, complete and store a "manufacturing" career plan
- Provides information on the skills needed for a position in manufacturing and helps the student link to training and education options

Additional technology and content features recommended for this site include:

- Rich graphics appealing to the intended audiences
- The technical capability to use broadband technology allowing for video/audio interviews and career profiles added to manufacturing career information and incorporating sample uses of such technology
- Highlight and promote career opportunities in manufacturing by illustrating the changing face of manufacturing in the United States
- The technical capability to offer online advice/live chats staffed by industry experts (e.g., association members; career professionals)
- Job/Career fair information
- Internships, information interviewing, and job shadow information resources
- Information on scholarships for educational and training related to manufacturing training programs
- Access to "where the jobs are" that is content managed and updated weekly
- Skill assessments based upon manufacturing industry skill standards and competencies, and cross-walked to education and training options (See Attachment for more detail on the Manufacturing Career Center Web site.)

The Career Center will blend the functionality from MVU-developed products such as the SBC Ameritech IT Career Center and myDreamExplorer. Brief descriptions of these two products follow:

SBC Ameritech IT Career Center - www.itcareercenter.org
The Information Technology Career Center sponsored by SBC is a feature rich site that focuses on news, information and certification training for Information Technology (IT) professionals or students who are studying Information Technology. User features include:

- IT Practice Tests
- Links to courses online specific to IT
- Links to Michigan colleges and universities
- Advice and help on certifications
- Links to major IT certifications and test centers (Cisco, Sun, Oracle, etc.)
- The basics of career planning and job placement

myDreamExplorer - www.mydreamExplorer.org
The myDreamExplorer Web site is four sites in one. A robust site created for middle and high school students, educators/counselors, parents and school administrators. Students can navigate through site with ease to systematically build an educational/employment plan. Features of this site include:

- Online assessments and tests
- Over 1,300 featured careers
- 550 career biographies capturing a "day in the life" in the career
- Access to school, college and training databases
- Comprehensive Educational Development Plan (EDP) to capture interests, abilities/skills, short and long term goals, 4-year high school course planning, etc.
- Parent resources and tools and access to their children's career planning data to support parental involvement
- Educator resources, including best practices, professional development opportunities, and reports based on student choices for careers, choices for colleges/training, etc.
- Weekly polls and a featured career/industry aligned with national, state and regional career focused initiatives (e.g., Pathways, Clusters)
- Weekly news for students, educators, and parents

The MDLEG and MMA will assist MVU in gathering valuable information about work in manufacturing for the Career Center Web site via their connections with manufacturers and employee organizations.

II. Implement an image reshaping outreach campaign to students, parents and educators involving a limited marketing effort, expansion of Michigan Manufacturing Week into a year-round event and establishment of a Manufacturing Academy at Ferris State University.

The Michigan Department of Labor and Economic Growth, the Michigan Virtual University and the Michigan Manufacturers Association will:

- seek greater involvement by Michigan manufacturers and labor organizations to market manufacturing careers, especially via school involvement programs including work-related learning options

- conduct outreach to schools to inform educators about the upside to manufacturing careers and to

- Explore options on how best to reach students, young workers, parents, and educators to turn manufacturing careers into a career choice of "preferred option"

The Michigan Manufacturers Association is one of the oldest and largest organizations of manufacturers in the nation. The Michigan Manufacturers Association was founded in 1902 to advocate on behalf of the state's industrial community in order to build a better business climate. Today, the MMA is one of a few associations of manufacturers that maintain its membership of pure manufacturing businesses. The organization keeps its membership informed about and involved with the leading workforce development issues through educational seminars and via work with policy-setting bodies at the state and local level. Through its Education and Training Advisory Committee, the MMA reviews education reform initiatives and advises the MMA on educational and training issues and needs.

Each year in May, by Declaration of the Governor, Michigan Manufacturing Week spotlights the tremendous importance of manufacturers. MMA's involvement in the observance includes helping to raise awareness of the key role manufacturing plays in Michigan's economy and helping members to plan establishment tours to expose school children to manufacturing careers. The MMA Plant Tour Program provides manufacturers an opportunity to open their facility doors to local school children, teachers, counselors and parents, as well as to government decision-makers and the media. (See http://www.mma-net.org/content/pdf/planttour.pdf for the MMA's Plant Tour Guide).

MMA proposes to:

- Expand the "Tour Program" to a year-round activity

- Develop the MMA/Manufacturing Exemplary Classroom Award – To provide recognition to educators/schools who demonstrate exemplary efforts to expose students to manufacturing (including science and technology) careers. MMA will explore options to develop an awards program for exemplary schools/educators, including work with MMA's Big Three Automaker partners to provide automobiles as prizes.

- Working with educational partners such as the Kettering University to increase the number of work-based learning options for young people

- Explore fund-raising activities to sustain a Michigan Manufacturing Careers Campaign

The MMA helps support the Manufacturing and Health Academy at Ferris State University at Big Rapids. This program is designed to acquaint educators with the working conditions, skill requirements and business operations of manufacturing and health industries. The academy combines health with manufacturing but interest is growing in having two separate academies. MMA proposes to work with Ferris Sate University to develop an academy focused solely on manufacturing.

- Modify the Manufacturing and Health Academy at Ferris State University so that a manufacturing only academy is in place

- Explore fund-raising activities to sustain the Ferris State University Manufacturing Academy

The Michigan Manufacturers Association and the Michigan Virtual University will develop a marketing campaign to promote manufacturing careers and counter the existing negative image. The targeted audiences for this campaign will be students, young workers, parents and educators. Print and perhaps other media will be used to carry the message about the opportunities and benefits of careers in manufacturing. Promotion of the Manufacturing Career Center Web site will be a key feature of the marketing program as will working with MMA and MDLEG reach the target audience with the proper message. Other features of the marketing effort will include:

- Convening focus groups of students, employers, educators and parents to identify what might appeal to them

- Developing a "brand" identity and a promotional saying/jingle for the marketing initiative

- Developing a dissemination strategy to reach the targeted groups

- Determining ways to measure the impact of the campaign.

III. Explore collaboration with the National Association of Manufactures (NAM) on their proposed national image-building campaign, including expansion of the Manufacturing Career Center and piloting a marketing campaign in a local labor market.

As indicated earlier, the National Association of Manufacturers has documented disturbing trends regarding the image of work in manufacturing across a broad spectrum of American society. For this reason, NAM is considering a "careers campaign" to position manufacturing careers as the preferred career choice by 2010. A key component of the campaign is the development of a national promotional project incorporating pilots to measure effectiveness in approximately 3 local labor markets. Other significant aspects of the initiative are:

- Leveraging NAM membership for high levels of employer involvement
- Coordinating with the American Association of Community Colleges

- Expanding internships
- Linking with the educational sector
- Conducting "Manufacturing Day" activities
- Creating a manufacturing career Web site

The State of Michigan, the Michigan Manufacturers Association and the Michigan Virtual University seek to explore strong linkages, or a joint effort, to tie the Michigan and NAM effort together. Although many aspects of NAM's and Michigan's projects could be coordinated, obvious areas of potential joint activities could include:

- Replication of the of the Michigan-based activities and products in other states and locales;
- Expansion of the Michigan Manufacturing Career Center Web site into a national, state-of-the-art, image-shaping destination for young people and others to explore work in manufacturing; and
- Identifying a local labor market in Michigan (through data from MDLEG's LMI program) for NAM's pilot test of the "Careers" marketing campaign.
- Assisting NAM with activities in the pilot local labor market.

Budget

The total cost is $443,000.

Coordination and communication by MMA	$50,000
Program planning and management by MVU	$30,000
Web site development by MVU	$296,550
MVU indirect costs	$66,450

Attachment

Manufacturing Career Center Web Site

The Manufacturing Career Center would be a robust site that allows users to create, modify and update career plans 24/7 with the rich industry specific career, training and news information. Additional features include:

- Information on the skills needed for manufacturing jobs, including an assessment and crosswalk to training and education options
- Links to Michigan colleges; universities, and Michigan Technical Education Centers (MTECs)
- Advice and information on industry certifications and industry skill standards, along with downloadable certification "roadmaps"
- Links to Michigan's Talent Bank for finding jobs
- The basics of career planning and job placement, with links to Michigan's workforce development agencies (MWA's and One Stops)
- Comprehensive Career Plan to capture interests, abilities/skills, short and long term goals
- Parent Resources and tools; access to student planning
- Educator Resources include best practices, professional development opportunities, reports based on student choices for careers, colleges/training, etc.
- Weekly polls and industry news
- Curriculum resources for educators, including industry-education research
- Manufacturing industry information aligned with national, state of regional career focused initiatives
- Weekly news for young adults (18 – 26), educators, and parents

"Marty Bolinger"
<MBolinger@fema-corp.com>
11/24/2003 02:01 PM

To <GaryOvans@ferris.edu>
cc
bcc
Subject RE: Mfg Eng needed...

I've always advised youngsters to do what they love, and success will naturally follow. If your day is over before you're ready to quit, then you've selected your career well!

The combination of creativity, cleverness, and perseverance will always be rewarded!

As for manufacturing and tooling, it will continue to be the backbone of our economy. We've just gone through a much-needed shaking-out period. Many of the tooling folks were getting pretty cocky... they lost focus on their customer's needs, coupled with some sloppy business practices. Something's wrong when tooling can be purchased in Asia both cheaper and with shorter lead-times, including shipping. From a practical prospective, overseas tooling sources must have close relationships with domestic. Someone has to be able to react quickly for try-outs, last minute changes, etc.

My gut feeling is that high-volume, low variation products will continue to go to low-cost labor markets. Throw in a fair amount of product variants, and the added inventory will prove intolerable unless produced near the actual point of use. Examples are office furniture and agricultural hydraulic valves. I'm working in the valve business, and we're experiencing a managed growth. Office furniture's demise has almost nothing to do with foreign competition, although the politicians are giving their ex-employees benefits supposedly generated for retraining due to foreign competition. I sit at a 40 year old desk worth about $50.00 that functions just as well as the $2000.00 units Steelcase is trying to push-off on their customers. Cost the material on a Steelcase desk, and you'll find under 10% of the price. Amazingly, overhead account for 5/6th... just sloppy business practices. Anyway, office furniture has a tremendous amount of order to order variation, and will never go overseas.

Also, China will be forced to float their currency eventually. This will even things out. North Korea could also make good on a threat or two, essentially reversing the trend east.

I am worried about our domestic automakers, and shy away from their industry. However, again, this has more to do with poor business practices, including manipulation by unions, than anything else. Honda and Toyota use the same suppliers as the big three, but are able to wring-out superior quality.

Manufacturing is not whale-blubber! Folks that understand sound manufacturing and tooling principles will always be in demand. However, it is a complicated business, and it's probably easier to make a living elsewhere... unless you love mechanisms!

Instructors and counselors who advise students not to go into manufacturing are likely doing our society a great injustice. I feel strongly that they should not be influencing our future with such an economically destructive orientation.

You asked!!!

Marty

-----Original Message-----
From: GaryOvans@ferris.edu [mailto:GaryOvans@ferris.edu]
Sent: Monday, November 24, 2003 11:30 AM
To: Marty Bolinger
Subject: Re: Mfg Eng needed...

U.S. Department of Labor
Bureau of Labor Statistics
Industry at a Glance
www.bls.gov

NAICS 31-33: Manufacturing

The manufacturing sector consists of establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products.

Counts from the **Quarterly Census of Employment and Wages** program show that the manufacturing sector employs many workers, but in a relatively small number of establishments.

- Over 64 percent of workers in the goods-producing sectors (which includes natural resources and mining, and construction) are **manufacturing employees**, yet manufacturing accounts for less than 30 percent of goods-producing establishments.
- In the economy as a whole, manufacturing represents **almost 12 percent of all employment**, yet **less than 5 percent of all establishments**.

urrent Employment Statistics estimates show annual average employment in manufacturing above 17 million between 1994 and 2000, before declining sharply. During 2003, **manufacturing employment** averaged 14,525,000.

[Chart data]

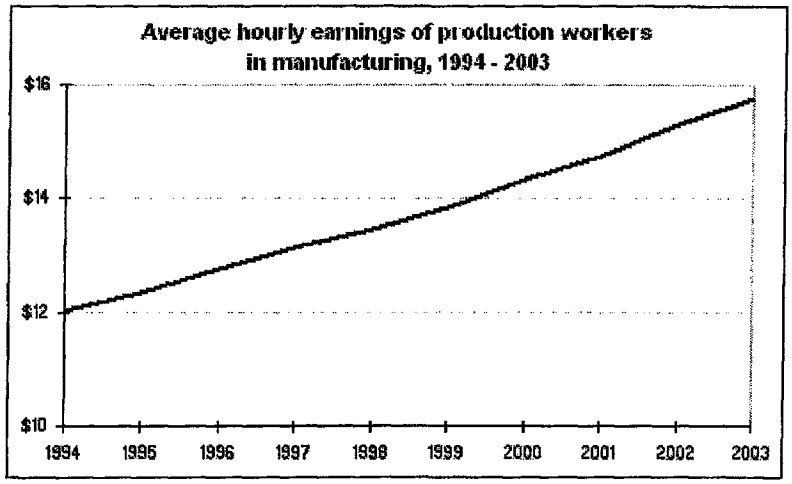
- Employment of production workers in manufacturing followed a similar pattern over the same period, with numbers above 12 million until a decline beginning in 2001. In 2003, **production workers in manufacturing** averaged 10,200,000.
- The **average weekly hours** of production workers in manufacturing were 40.4 in 2003, well above the **private industry** average of 33.7 for production and nonsupervisory workers.

Industry at a Glance

Industries
Construction
Education and health services
Financial activities
Government
Information
Leisure and hospitality
Manufacturing
Natural resources and mining
Other services
Professional and business services
Transportation and utilities
Wholesale and retail trade

Contacts
Industry-data

- **Average hourly earnings** of production workers in manufacturing were $15.74 in 2003, slightly higher than the average of $15.35 for production and nonsupervisory workers in all **private industry**.



[**Chart data**]

In 2003, the **unemployment rate** of persons most recently employed in manufacturing industries was 6.6 percent, according to the **Current Population Survey**. The **overall unemployment rate** was 6.0 percent.

Data from the **Mass Layoff Statistics** program show that, in 2002, there were 2,378 **extended mass layoff events** in manufacturing, resulting in 454,034 **separations** of workers from their jobs and 469,774 **initial claimants** for unemployment insurance.

Employment Projections data indicate that manufacturing employment will decrease 1.0 percent over the 2002-12 period. Total employment for **all industry sectors** is projected to increase 14.8 percent.

Labor productivity—defined as output per hour—grew by 5.1 percent in manufacturing from **2002 to 2003**, according to data from the **Productivity and Costs** program. Productivity and unit labor cost data are available for the manufacturing sector as a whole, both on a **labor productivity** basis and on a **multifactor productivity** basis. There are separate measures of productivity for **many detailed manufacturing industries**.

The **Producer Price Index** for the net output of total manufacturing industries increased 2.5 percent from **2002 to 2003**.

In addition, statistics on manufacturing are produced by the BLS **Injuries, Illnesses, and Fatalities** program; this program will be releasing industry data on a NAICS basis in the second half of 2004, and then this page will be updated with such data. See the **BLS NAICS Implementation Schedule** for other implementation dates.

The **Career Guide to Industries** contains descriptions of industries in the manufacturing sector as well as information about working conditions, current and projected employment, occupations, and earnings in those industries. See: **Aerospace Product and Parts Manufacturing**, **Apparel Manufacturing**, **Chemical Manufacturing, Except Pharmaceutical and Medicine**

Manufacturing, **Computer and Electronic Product Manufacturing**, **Food Manufacturing**, **Motor Vehicle and Parts Manufacturing**, **Pharmaceutical and Medicine Manufacturing**, **Printing**, **Steel Manufacturing**, and **Textile Mills and Products**.

Last Modified Date: April 13, 2004

Back to Top

www.dol.gov

Frequently Asked Questions | **Freedom of Information Act** | **Customer Survey**
Privacy & Security Statement | **Linking to Our Site** | **Accessibility**

U.S. Bureau of Labor Statistics
Division of Information Services
Suite 2860
Massachusetts Avenue, NE
Washington, DC 20212-0001

URL: **http://www.bls.gov/iag/iaghome.htm**
Phone: (202) 691-5200
Fax: (202) 691-7890
Industry at a Glance questions: **blsdata_staff@bls.gov**
Technical (web) questions: **webmaster@bls.gov**
Other comments: **feedback@bls.gov**

Gross domestic product

From Wikipedia, the free encyclopedia.

In economics, the **gross domestic product (GDP)** is a measure of the amount of the economic production of a particular territory in financial capital terms during a specific time period.

Table of contents

Definition

GDP is defined as the total value of all goods and services produced within that territory during a specified period (most commonly, per year). GDP differs from gross national product in excluding inter-country income transfers, in effect attributing to a territory the product *generated* within it rather than the incomes *received* in it.

Whereas **nominal GDP** refers the total amount of money spent on GDP, **real GDP** refers to an effort to correct this number for the effects of inflation in order to estimate the sum of the actual quantity of goods and services making up GDP. The former is sometimes called "money GDP," while the latter is termed "constant-price" or "inflation-corrected" GDP -- or "GDP in base-year prices" (where the base year is chosen arbitrarily). See real vs. nominal in economics.

A common equation for GDP is:

$$GDP = consumption + investment + government\ expenditures + exports - imports$$

Aggregate expenditures are calculated in a similar way, although the aggregate expenditures formula does not account for unplanned investment (left over inventory at the end of the reporting cycle) and is more commonly used by economic theorists.

GDPs of different countries may be compared by converting their value in national currency according to *either*

- **current exchange rate method**: GDP calculated by exchange rates prevailing on international currency markets
- **purchasing power parity method**: GDP calculated by purchasing power parity (PPP) of each currency relative to a selected standard (usually the United States dollar).

The relative ranking of countries may differ dramatically between the two approaches.

The *purchasing power parity method* accounts for the relative effective domestic purchasing power of the average producer or consumer within an economy. This can be a better indicator of the living standards of less-developed countries because it compensates for the weakness of local currencies in world markets.

The *current exchange rate method* converts the value of goods and services using global currency exchange rates. This can offer better indications of a country's international purchasing power and relative economic power.

For more information see measures of national income.

Problems

Although GDP is widely used by economists, its value as an indicator has also been the subject of controversy. Criticisms of GDP include:

- Very often different calculations of the GDP are confused among each other. One should especially regard whether it is calculated by purchasing power parity method or current exchange rate method.
- GDP, as a measure of economic size, fails to measure well-being and living standards accurately.
- GDP doesn't take into account the black economy, non-monetary economy such as bartering, volunteer work, or informal creation of wealth, such as unpaid childcare provided by non-working parents.
- GDP doesn't measure the sustainability of growth, as a country may achieve a temporary high GDP by over-exploiting natural resources.
- GDP counts work that produces no net gain, and does not account for negative externalities. For example, if a factory pollutes a river, that boosts GDP, and when the taxpayers pay to have it cleaned up, that boosts GDP again. *See* parable of the broken window.

List of total GDP by country (Purchasing Power Parity Method)

Rank	Entity	PPP total (U.S dollars)	PPP/capita (U.S dollars)	Population (2003 est.)
	European Union*	11.50 trillion	25,300	454,900,000
1.	United States	10.40 trillion	37,600	290,343,000
2.	Mainland China	5.70 trillion	4,400	1,287,000,000
3.	Japan	3.55 trillion	28,000	127,215,000
4.	India	2.66 trillion	2,540	1,049,701,000
5.	Germany	2.18 trillion	26,600	82,399,000
6.	France	1.54 trillion	25,700	60,181,000
7.	United Kingdom	1.52 trillion	25,300	60,095,000
8.	Italy	1.44 trillion	25,000	57,998,000
9.	Russia	1.35 trillion	9,300	144,526,000
10.	Brazil	1.34 trillion	7,600	182,032,000
11.	South Korea	931 billion	19,400	48,249,000
12.	Canada	923 billion	29,400	32,207,000
13.	Mexico	900 billion	9,000	104,908,000
14.	Spain	828 billion	20,700	40,218,000
15.	Indonesia	663 billion	3,100	234,894,000
16.	Australia	528 billion	27,000	19,732,000
17.	Turkey	468 billion	7,000	68,110,000
18.	Iran	456 billion	7,000	68,279,000
19.	Netherlands	434 billion	26,900	16,151,000
20.	South Africa	432 billion	10,000	42,769,000
21.	Thailand	429 billion	6,900	70,000,000
22.	Taiwan	406 billion	18,000	22,116,000
23.	Argentina	391 billion	10,200	38,000,000
24.	Poland	368 billion	9,500	38,000,000

(1) Although the European Union is not formally a nation, it is tied together with a single currency (excluding the UK, Sweden, Denmark, and the 10 new member states) and is considered by some to be a single entity.

The methodology for deriving accurate PPP comparisons remains under constant review, and questions have been raised as to whether the relative size of Mainland China's GDP may be overstated to some extent.

Source: CIA World Factbook: *PPP (http://www.odci.gov/cia/publications/factbook/fields/2001.html)*, *PPP/Capita (http://www.odci.gov/cia/publications/factbook/fields/2004.html)*, *Population (http://www.odci.gov/cia/publications/factbook/fields/2119.html)*

For further data, see List of countries by GDP (PPP)

List of total GDP by country (Current Exchange Rate Method)

Total GDP 2003 (millions of Ranking Economy US dollars). The ranking is different to the list above, which uses PPP method

(If changing numbers, please use the same source for all countries)

- USD 10,958,833 -- European Union
- USD 8,174,681 -- Eurozone

1. USD 10,881,609 -- United States
2. USD 4,326,444 -- Japan
3. USD 2,400,655 -- Germany
4. USD 1,794,858 -- United Kingdom
5. USD 1,747,973 -- France
6. USD 1,465,895 -- Italy
7. USD 1,409,852 -- Mainland China
8. USD 836,100 -- Spain
9. USD 834,390 -- Canada

   USD 626,080 -- Mexico
11. USD 605,331 -- South Korea
12. USD 598,966 -- India
13. USD 518,382 -- Australia
14. USD 511,556 -- Netherlands
15. USD 492,338 -- Brazil
16. USD 433,491 -- Russian Federation
17. USD 309,465 -- Switzerland
18. USD 302,217 -- Belgium
19. USD 300,795 -- Sweden
20. USD 251,456 -- Austria
21. USD 237,972 -- Turkey
22. USD 221,579 -- Norway
23. USD 212,404 -- Denmark
24. USD 209,563 -- Poland
25. USD 208,311 -- Indonesia

Source: Worldbank (*http://www.worldbank.org/data/databytopic/GDP.pdf*)

For further data, see list of countries by GDP.

See also

- GDP deflator
  Measures of national income
- Natural gross domestic product
- Uneconomic growth

External links

- What's wrong with the GDP? (*http://dieoff.org/page11.htm*)
- Complete listing of countries by GDP: Purchasing Power Parity Method (*http://aol.countrywatch.com/includes/grank/globrank.asp?TBLS=PPP+Method+Tables&vCOUNTRY=17&TYPE=GRANK*) and Current Exchange Rate Method (*http://aol.countrywatch.com/includes/grank/gdpnumericcer.asp?TYPE=GRANK&TBL=NUMERICCER&vCOUNTRY=17*)

U.S. Department of Labor
Bureau of Labor Statistics
Occupational Employment Statistics
www.bls.gov

Occupational Employment and Wages, May 2003

17-2112 Industrial Engineers

Design, develop, test, and evaluate integrated systems for managing industrial production processes including human work factors, quality control, inventory control, logistics and material flow, cost analysis, and production coordination. Exclude "Health and Safety Engineers, Except Mining Safety Engineers and Inspectors" (17-2111).

National estimates for this occupation
Industry profile for this occupation
State profile for this occupation
Metropolitan area profile for this occupation

National estimates for this occupation: Top

Employment estimate and mean wage estimates for this occupation:

Employment (1)	Employment RSE (3)	Mean hourly wage	Mean annual wage (2)	Wage RSE (3)
156,780	1.6 %	$30.91	$64,290	0.4 %

Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$19.60	$24.33	$30.23	$36.66	$43.79
Annual Wage (2)	$40,760	$50,600	$62,890	$76,260	$91,090

Industry profile for this occupation: Top

Industries with the highest levels of employment in this occupation:

Industry	Employment	Hourly mean	Annual	Employment	Wage rank

		wage	mean wage	rank	
Motor vehicle parts manufacturing	11,560	$30.23	$62,870	1	60
Aerospace product and parts manufacturing	9,230	$31.30	$65,100	2	43
Semiconductor and electronic component mfg.	9,070	$34.21	$71,150	3	16
Electronic instrument manufacturing	8,230	$32.17	$66,920	4	31
Architectural and engineering services	7,910	$31.33	$65,170	5	42

Top paying industries for this occupation:

Industry	Employment	Hourly mean wage	Annual mean wage	Employment rank	Wage rank
Support activities for mining	70	$40.38	$84,000	120	1
Tobacco manufacturing	150	$39.84	$82,870	93	2
Oil and gas extraction	920	$39.79	$82,760	43	3
Rail transportation	50	$37.27	$77,530	128	4
Electronics and appliance stores	140	$36.32	$75,540	94	5

State profile for this occupation: Top

States with the highest concentration of workers in this occupation:

State	Employment	Hourly mean wage	Annual mean wage	Percent of State employment	Wage rank within State
Michigan	13,460	$31.79	$66,120	0.310%	76
Indiana	7,080	$28.14	$58,530	0.248%	83
Idaho	1,160	$34.35	$71,450	0.205%	25
Ohio	10,270	$30.12	$62,650	0.192%	79
Connecticut	2,900	$31.62	$65,760	0.177%	101

Top paying States for this occupation:

State	Employment	Hourly mean wage	Annual mean wage	Percent of State employment	Wage rank within State
Alaska	80	$38.28	$79,630	0.027%	24
California	17,750	$34.96	$72,720	0.122%	87
District of Columbia	210	$34.63	$72,030	0.035%	69
Wyoming	130	$34.61	$72,000	0.054%	16
Idaho	1,160	$34.35	$71,450	0.205%	25

Metropolitan area profile for this occupation: Top

Metropolitan areas with the highest concentration of workers in this occupation:

MSA	Employment	Hourly mean wage	Annual mean wage	Percent of MSA employment
San Jose, CA PMSA	5,580	$40.86	$84,990	0.636%
Lawrence, MA-NH PMSA	950	$34.82	$72,420	0.615%
Boulder-Longmont, CO PMSA	630	$36.89	$76,740	0.407%
Dayton-Springfield, OH MSA	1,770	$32.21	$66,990	0.393%
Rochester, NY MSA	1,890	$28.91	$60,120	0.370%

Top paying Metropolitan areas for this occupation:

MSA	Employment	Hourly mean wage	Annual mean wage	Percent of MSA employment
Huntington-Ashland, WV-KY-OH MSA	40	$48.51	$100,910	0.035%
San Jose, CA PMSA	5,580	$40.86	$84,990	0.636%
Odessa-Midland, TX MSA	40	$38.91	$80,920	0.039%
Richland-Kennewick-Pasco, WA MSA	140	$38.31	$79,680	0.176%
Rochester, MN MSA	80	$38.14	$79,320	0.082%

About May 2003 National, State, and Metropolitan Area Occupational Employment and Wage Estimates

---

To see profiles of other occupations, select from the major groups below:

Select a major group to view 

These estimates are calculated with data collected from employers in all industry sectors in metropolitan and non-metropolitan areas in every State and the District of Columbia. The top five employment and wage figures are provided above. The complete list is available in the **downloadable Excel files(XLS)**.

Percentile wage estimates show the percentage of workers in an occupation that earn less than a given wage and the percentage that earn more. The median wage is the 50th percentile wage estimate--50 percent of workers earn less than the median and 50 percent of workers earn more than the median. **More about percentile wages.**

(1) Estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self-employed workers.

(2) Annual wages have been calculated by multiplying the hourly mean wage by a "year-round, full-time" hours figure of 2,080 hours; for those occupations where there is not an hourly mean wage published, the annual wage has been directly calculated from the reported survey data.

(3) The relative standard error (RSE) is a measure of the reliability of a survey statistic. The smaller the relative standard error, the more precise the estimate.

All **Architecture and Engineering Occupations**

2003 May National Occupational Employment and Wage Estimates

2003 May State Occupational Employment and Wage Estimates

2003 May Metropolitan Area Occupational Employment and Wage Estimates

2003 May National Industry-Specific Occupational Employment and Wage Estimates

List of Occupations in SOC Code Number Order

List of Occupations in Alphabetical Order

Download May 2003 Occupational Employment and Wage Estimates in Zipped Excel files

Technical notes

Last Modified Date: May 7, 2004

Back to Top

Frequently Asked Questions | Freedom of Information Act | Customer Survey
Privacy & Security Statement | Linking to Our Site | Accessibility

Bureau of Labor Statistics
Division of Occupational Employment Statistics
Suite 2135
2 Massachusetts Ave., NE
Washington, DC 20212-0001

URL: http://www.bls.gov/OES
Phone: (202) 691-6569
Fax: (202) 691-6645
OES data questions: oesinfo@bls.gov
Technical (web) questions: webmaster@bls.gov
Other comments: feedback@bls.gov

July 29, 2004

Dear Gary:

The rebirth of manufacturing in North America has begun. "Outsourcing" is about to be replaced with "insourcing," as North American manufacturing makes its biggest comeback in 25 years. To be one of the companies that will benefit from this influx of business, it is imperative that you know how to equip your operation with the latest machinery and technology.

As chairman of the board of AMT – The Association For Manufacturing Technology and president of Wes-Tech, I have witnessed a dramatic increase in the demand for goods and equipment manufactured in North America over the last 12 months. This is not a fluke, rather a significant, sustained and measurable upswing supported by industry statistics that is likely to continue for years to come.

Why? Because the technologically advanced equipment now available is rendering low overseas labor costs irrelevant due to exponential increases in productivity and efficiency. Rising worldwide energy costs, skyrocketing shipping fees, and upcoming adjustments in currency markets are creating a manufacturing climate that no longer consistently favors production outsourcing.

Attending this year's International Manufacturing Technology Show (IMTS) is a must if your business is going to benefit from this manufacturing resurgence. **I am so convinced that you should be at IMTS that I have authorized AMT to extend the early registration discount for you through August 20, 2004.** Here's how to take advantage of this special offer: Go to http://ww7.expocard.com/shows/imt041/special to register, or complete and mail or fax back the enclosed special registration form.

Sincerely,

Robert Weskamp
President, Wes-Tech
Chairman of the Board, AMT – The Association For Manufacturing Technology

P.S. **Our discounted $20 registration fee is only good until August 20, 2004.** Don't delay. Register now at http://ww7.expocard.com/shows/imt041/special, or fill out the enclosed form and fax it to 301-694-5124 or return by mail.

Related BLS programs | Related articles

EXCERPT

February 2004, Vol. 127, No. 2

Industry output and employment projections to 2012

Jay Berman

The Bureau of Labor Statistics projects total employment in the United States to increase by 21.3 million during the 2002–12 period, rising from 144.0 million to 165.3 million. This increase results in a projected annual growth rate of 1.4 percent, which is slightly slower than the 1.6-percent rate of growth experienced during the preceding decade. The increase of nonfarm wage and salary jobs, from 131.1 million in 2002 to 152.7 million in 2012, is expected to account for most of the growth in total employment. The number of nonfarm self-employed workers and unpaid family workers is expected to increase by 144,000. Countering these gains, agricultural employment, which includes wage and salary workers, the self-employed, and unpaid family workers, is projected to decrease by 340,000 to settle at 1.9 million by 2012. (See table 1.)

Real industry output is projected to expand to $23.3 trillion by 2012, an increase of $6.4 trillion from the $16.8 trillion level achieved in 2002.[1] This translates into a projected 3.3-percent average annual growth rate and parallels the rate of growth exhibited during the past decade. Accounting for approximately 70.8 percent of the growth in total nominal output, the service-providing industries are projected to reach $15.5 trillion by 2012. Even though output in this sector is expected to grow by $4.5 trillion by 2012, its projected 3.5 percent growth rate is slightly slower than that generated during the past decade. This is contrasted against the 3.0-percent annual growth expected by the goods-producing sector, which is faster than the historical 2.3 percent growth rate that this sector experienced between 1992 and 2002. Even with the relatively accelerated rate of output growth in the goods-producing sector, excluding agriculture, its share of current-dollar total output, however, will continue to decline from 31.4 percent in 1992 to 25.1 percent by 2012.[2] Annual output growth in agriculture is expected to grow slightly from the previous 10-year period, to 1.6 percent annually. Its share of total output, however, will also decline, dropping from 2.2 percent in 1992 to 1.3 in 2002. (See table 2.)

▸ Read abstract ▸ Download full article in PDF (159K)

Footnotes

1 This article uses the gross duplicated output concept. Gross duplicated output measures not only GDP, or all final demand purchases of new goods and services, but also all new goods and services produced as intermediate goods for use in further production. Real output is measured as a 1996 based chain-weighted Fisher index and is used for historical rate of growth comparisons. Real output on an industry basis does not add to their higher level aggregates because of chain weighting. See Charles Steindel, "Chain-weighting: The New Approach to Measuring GDP," *Current Issues in Economics and Finance*, Federal Reserve Board of New York, December 1995.

2 Providing a more accurate measure of the relative importance of aggregated sectors of the economy, current-dollar output estimates were used in lieu of chain-weighted measures. See J. Steven Landefeld, Brent R. Moulton, and Cindy M. Vojtech, "Chained-Dollar Indexes: Issues, Tips on Their Use, and Upcoming Changes," *Survey of Current Business*, US Department of Commerce, November 2003, pp. 8–16.

Related BLS programs

Employment Projections

Related *Monthly Labor Review* articles

Industry output and employment projections to 2010—Nov. 2001.
Industry output and employment projections to 2008.—Nov. 1999.
Industry output and employment projections to 2006.—Nov. 1997.
Industry output and employment projections to 2005. Nov. 1995.
Industry output and employment.—Nov. 1993.
Industry output, employment growth slowdown continues.—Nov. 1991.

Within *Monthly Labor Review Online*:
Welcome | Current Issue | Index | Subscribe | Archives

Exit *Monthly Labor Review Online*:
BLS Home | Publications & Research Papers

Section 8

Facilities and Equipment

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 three other schools (Central Michigan University, Western 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 did NOT, up until recently, have any facilities that it could 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.

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 plastics and rubber programs are supported by the National Elastomer Center facilities. BS Welding Engineering Technology laboratories, the Granger Center, upgraded Electronics and CAD Drafting areas, the expansive area dedicated to printing, 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. While the program has recently been allocated Swan 101 as a "dedicated" manufacturing resource area, it has the limitations of being useful only for general purpose lecture/ soft lab activities, and will require thousands of dollars in physical plant refurbishment (Ref. Appendix).

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, and envisioned cross-curricular capstone projects. This could be in the form of an "Engineering Tech. Center" where students and faculty from different programs could work collaboratively on common projects.

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	• Conduct stop watch time studies in a production setting • Design and test

	studying a production operation in the machine shop. • Paper work labs that have students using IE tools on fictitious scenarios.	ergonomic work stations • Apply actual IE tools in a production setting. e.g., right hand/left hand; process flow analysis, etc.., evaluate alternative workstation configurations to facilitate ergonomics and "Lean Manufacturing" concepts.
Course Name	Existing Lab Activity	Proposed Lab Activity
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 • Conduct gage Bias and Linearity studies	• 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 • Evaluate part features with respect to GD & T
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.	• 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	• None	• Design and conduct

Experiments I	industrial-type experiments for the purpose of trouble shooting and/or modeling manufacturing processes

D. BENCHMARK FACILITIES

Three 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. Since then, CMU has graduated over a thousand 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 machining, foundry, design, and testing labs to 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, as of 1998, was where we would like to be, now.

Western Michigan University, Kalamazoo, MI. Gary Ovans, Department Chair, toured the new College of Engineering facility as part of the proceedings of the American Society of Engineering Education North Central Section Spring Conference. The 350,000 square foot facility was completed in 2003 at a cost of approximately $80,000,000. While not all of the manufacturing related areas are completely fleshed-out, at this writing, the first-class facility provides a sound, well designed structure to support engineering and engineering technology activities.

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 is at risk.

Section 9

Curriculum Evaluation

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.

In the field of manufacturing engineering technology education, the benchmark for curriculum review has long been the TAC of ABET (Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.) "Criteria for Accrediting Engineering Technology Programs", in conjunction with the SME (Society of Manufacturing Engineers) "Program Criteria for Manufacturing Engineering Technology and Similarly Named Programs". The latest edition of these criteria are effective for the 2004-2005 academic year. As almost all of our off-campus competitors are ABET-accredited, this serves as an excellent comparative tool to them as well.

The latest revisions of the aforementioned documents reflect the recent change from the traditional checklist-style requirements of the past to that of outcomes assessment, for which two present MFGE faculty are registered as approved ABET program evaluators. Though our Industrial Advisory Board has cautioned us for years to not sacrifice the unique strengths of the MFGE program in order to achieve what they consider to be an achievement of dubious worth, at least with respect to coursework the time may have come to revisit the issue in earnest. With respect to coursework, the MFGE program has probably never been closer to being in compliance with the criteria, but lack of facilities continues to restrict just how much progress we can make in the area. The full text of the applicable criteria are reproduced here over the next several pages in indented Arial font, with our findings of non-compliance from a preliminary self-evaluation inserted where appropriate in left-justified Times New Roman.

Criteria for Accrediting Engineering Technology Programs

Effective for Evaluations during the 2004-2005 Accreditation Cycle

It is the responsibility of the institution seeking accreditation of an engineering technology program to demonstrate clearly that the program meets the following criteria.

Criterion 1. Program Educational Objectives

Although institutions may use different terminology, for purposes of Criterion 1, *program educational objectives* are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve during the first few years following graduation.

Each engineering technology program must have in place:

a. published educational objectives that are consistent with the mission of the institution and applicable ABET criteria,
b. a documented process by which the objectives are determined and periodically evaluated based on the needs of constituencies served by the program, and
c. an educational program, including a curriculum, that enables graduates to achieve the educational objectives.

This process would need to be formally completed, although work we have done to meet NCA (North Central Accreditation) requirements is a good start.

Criterion 2. Program Outcomes

Although institutions may use different terminology, for purposes of Criterion 2, *program outcomes* are statements that describe what units of knowledge or skill students are expected to acquire from the program to prepare them to achieve the program educational objectives. These are typically demonstrated by the student and measured by the program at the time of graduation.

An engineering technology program must demonstrate that graduates have:

a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines,
b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology,
c. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,
d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives,
e. an ability to function effectively on teams,
f. an ability to identify, analyze and solve technical problems,

g. an ability to communicate effectively,
h. a recognition of the need for, and an ability to engage in lifelong learning,
i. an ability to understand professional, ethical and social responsibilities,
j. a respect for diversity and a knowledge of contemporary professional, societal and global issues, and
k. a commitment to quality, timeliness, and continuous improvement.

Demonstration of items i. and j. would require access to institutional data, which to our knowledge has not been shared with program faculty.

Criterion 3. Assessment and Evaluation

Each program must utilize multiple assessment measures in a process that provides documented results to demonstrate that the program objectives and outcomes are being met.

Assessment measures typically consist of, but are not limited to, student portfolios, student performance in project work and activity-based learning; results of integrated curricular experiences; relevant nationally-normed examinations; results of surveys to assess graduate and employer satisfaction with employment, career development, career mobility, and job title; and preparation for continuing education.

Each program must demonstrate that the results of the assessment of program objectives and outcomes are being used to improve and further develop the program in accordance with a documented process.

Criterion 4. Program Characteristics

The program must provide an integrated educational experience that develops the ability of graduates to apply pertinent knowledge to solving problems in the engineering technology specialty. The orientation of the technical specialization must manifest itself through program objectives, faculty qualifications, program content, and business and industry guidance.

CURRICULUM

These criteria specify subject areas and minimum total credit hours essential to all engineering technology programs. The curriculum must appropriately and effectively develop these

subject areas in support of program and institutional objectives.

Total Credits Baccalaureate programs must consist of a minimum of 124 semester hours or 186 quarter hours of credit. Associate degree programs must consist of a minimum of 64 semester hours or 96 quarter hours of credit.

Communications The communications content must develop the ability of graduates to:

a. plan, organize, prepare, and deliver effective technical reports in written, oral, and other formats appropriate to the discipline and goals of the program,
b. incorporate communications skills throughout the technical content of the program,
c. utilize the appropriate technical literature and use it as a principal means of staying current in their chosen technology, and
d. utilize the interpersonal skills required to work effectively in teams.

Mathematics The level and focus of the mathematics content must provide students with the skills to solve technical problems appropriate to the discipline and the program objectives. Algebra, trigonometry, and an introduction to mathematics above the level of algebra and trigonometry constitute the foundation mathematics for an associate degree program. Integral and differential calculus, or other appropriate mathematics above the level of algebra and trigonometry, constitutes the foundation mathematics for baccalaureate programs.

Compliance with the math requirement would rely on our ability to justify our position that additional statistics-based course are more useful in the manufacturing engineering technology field than a second semester of calculus.

Physical and Natural Science The basic science content can include physics, chemistry, or life and earth sciences that support program objectives. This component must include laboratory experiences which develop expertise in experimentation, observation, measurement and documentation.

Social Sciences and Humanities The social sciences and humanities content must support technical education by broadening student perspective and imparting an

understanding of diversity and the global and societal impacts of technology.

Technical Content The technical content of a program must focus on the applied aspects of science and engineering in that portion of the technological spectrum closest to product improvement, manufacturing, construction and engineering operational functions. The technical content must develop the skills, knowledge, methods, procedures, and techniques associated with the technical discipline and appropriate to the goals of the program.

The technical content develops the depth of technical specialty and must represent at least 1/3 of the total credit hours for the program. In order to accommodate the essential mathematics, sciences, communications, and humanities components, the technical content is limited to no more than 2/3 the total credit hours for the program.

a. The technical content of the curriculum consists of a technical core and the increasingly complex technical specialties found later in the curriculum. The technical core must provide the prerequisite foundation of knowledge necessary for the technical specialties.
b. Laboratory activities must develop student competence in the use of analytical and measurement equipment common to the discipline and appropriate to the goals of the program.
c. Technical courses must develop student knowledge and competence in the use of standard design practices, tools, techniques, and computer hardware and software appropriate to the discipline and goals of the program.
d. Capstone or other integrating experiences must draw together diverse elements of the curriculum and develop student competence in focusing both technical and non-technical skills in solving problems.

Cooperative Education Cooperative education credit used to satisfy prescribed elements of these criteria must include an appropriate academic component evaluated by the program faculty.

Criterion 5. Faculty

Overall competence of the faculty will be evaluated through such factors as formal education, balance of academic experience and professional practice, industrial experience, professional certification, teaching experience, teaching effectiveness, technical currency, scholarly activity, professional society participation, communication skills, extracurricular support for student activities, and similar attributes appropriate to the program objectives.

Individual faculty members must have educational backgrounds, industrial experience, professional practice, communication skills, and technologically current knowledge that support the field of instruction and program objectives. Collectively, the faculty must be capable of providing students an appropriate breadth of perspective and effective instruction in the use of modern technical and non-technical methodologies in careers appropriate to the program objectives.

The program must have an effective professional development plan for its faculty.

For the entire College of Technology, professional development is on a funds-available basis, with the traditional (at Ferris) restriction regarding for-credit coursework. "Effective" is a very subjective evaluation.

The number of faculty members must be sufficient to provide program continuity, proper frequency of course offerings, appropriate levels of student-faculty interaction, and effective student advising and counseling.

Comparisons to other institutions are difficult, but our steady use of temporary- and adjunct faculty for MFGE-prefixed courses may raise some questions. Fortunately, most courses taught to MFGE majors are by MFGE-dedicated full-time faculty.

Each program must have effective leadership through a full-time faculty member with defined leadership responsibilities for the program.

The program faculty must have sufficient responsibility and authority to define, revise, implement, and achieve program objectives.

Criterion 6. Facilities

Adequate facilities and financial support must be provided for each program in the form of:

a. suitable classrooms, laboratories, and associated equipment necessary to accomplish the program objectives in an atmosphere conducive to learning,
b. laboratory equipment characteristic of that encountered in the industry and practice served by the program,
c. modern computing equipment and software, characteristic of that encountered in the industry and professional practice served by the program, and
d. Internet and information infrastructures, including electronic information repositories, equipment catalogs, professional technical publications, and manuals of industrial processes and practices adequate to support the educational objectives of the program and related scholarly activities of students and faculty.

Facilities are discussed elsewhere within this document; suffice it to say that our access to production-type machinery and equipment is practically nonexistent, and if we had not taken the initiative to require all MFGE students to provide their own laptop computers, our computer access would also be sorely lacking.

Criterion 7. Institutional and External Support

ADMINISTRATION

The administration must be effective in the:

a. selection, supervision and support of the faculty,
b. selection and supervision of the students,
c. operation of support facilities for faculty and students, and
d. interpretation of the college to members of engineering and technical professions and the public.

INSTITUTIONAL SUPPORT

Institutional support must include:

a. adequate financial resources and constructive leadership to assure the quality and continuity of the engineering technology program
b. resources sufficient to attract, retain and provide for the continued professional development of a well-qualified faculty

c. sufficient financial and human resources to acquire, maintain, update and operate facilities and equipment appropriate for the program,
d. procedures for selecting students, advising students, and assuring that all graduates have met all curricular requirements, and
e. services to assist students in finding employment upon graduation.

Flat- or negative funding for years puts this whole category in jeopardy; here the final judge of "adequate" is the provider, not the receiver.

PROGRAM ADVISEMENT

An advisory committee representing the organizations that employ graduates must be utilized to advise the program in establishing, achieving, and assessing its goals. The committee must periodically review program curricula, and provide advisement on current and future needs of the technical fields in which graduates are employed.

Criterion 8. Program Criteria

Where applicable, each program must satisfy program criteria that amplify these general criteria and provide the specifics needed for a given discipline. A program must satisfy all program criteria applicable to the technical specialties implied in the program title.

PROGRAM CRITERIA FOR MANUFACTURING ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS
Lead Society: Society of Manufacturing Engineers

Applicability
These program criteria apply to engineering technology programs that include "manufacturing" and modifiers in their titles.

Objective
An accreditable baccalaureate degree program in manufacturing engineering technology will prepare graduates with technical and leadership skills necessary to enter careers in process and systems design, manufacturing

operations, maintenance, technical sales or service functions in a manufacturing enterprise.
Graduates of associate degree programs typically have strengths in manufacturing operations, maintenance and service functions.

Outcomes
Programs must demonstrate that graduates are prepared for careers centered on the manufacture of goods. In this context, 'manufacturing' is a process or procedure through which plans, materials, personnel, and equipment are transformed in some way that adds value.

Graduates must demonstrate the ability to apply the technologies of materials, manufacturing processes, tooling, automation, production operations, maintenance, quality, industrial organization and management, and statistics to the solution of manufacturing problems.

Graduates must demonstrate the ability to successfully complete a comprehensive design project related to the field of manufacturing.

Section 10

Enrollment Trends

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 captive 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. Students in "MFGE-major only" classes fall into numerous categories:

- Regularly admitted full-time MFGE 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, CDTD, and MFGT students who have not completed all of their AAS requirements.
- Students who are seeking a double major at Ferris - especially a problem for us with plastics students, who are not allowed to register for plastics courses unless they are listed as plastics majors (and 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, some 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; these numbers of course do not include SCH generated by students in non-MFGE programs (e.g., ITMOs) taking MFGE courses alongside MFGE majors. Analysis and discussion follow.

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

	Academic Year								
Category	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
MFGE	49	51	41	43	46	50	45	35	29
Pre-MFGE	4	1	2	3	3	3	3	3	4
METO	60	69	62	60	55	57	75	81	62
QT	5		2	1		1	1	2	1
QETO			7	13	6	13	14	19	16
METO+QETO	60	69	69	73	61	70	89	100	78
MFGE total	118	121	114	120	110	124	138	140	106
MET	59	51	45	46	47	62	67	79	81
TDTD	71	67	71	69	67	59	70	74	86
MFGT	36	62	68	58	65	60	55	57	61
Feeder total	166	180	184	173	179	181	192	210	228

Table 10-1 Key
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 BS and AAS programs
TDTD - FSU Tool Design & Technical Drafting AAS program
MFGT - FSU Manufacturing Tooling Technology AAS program

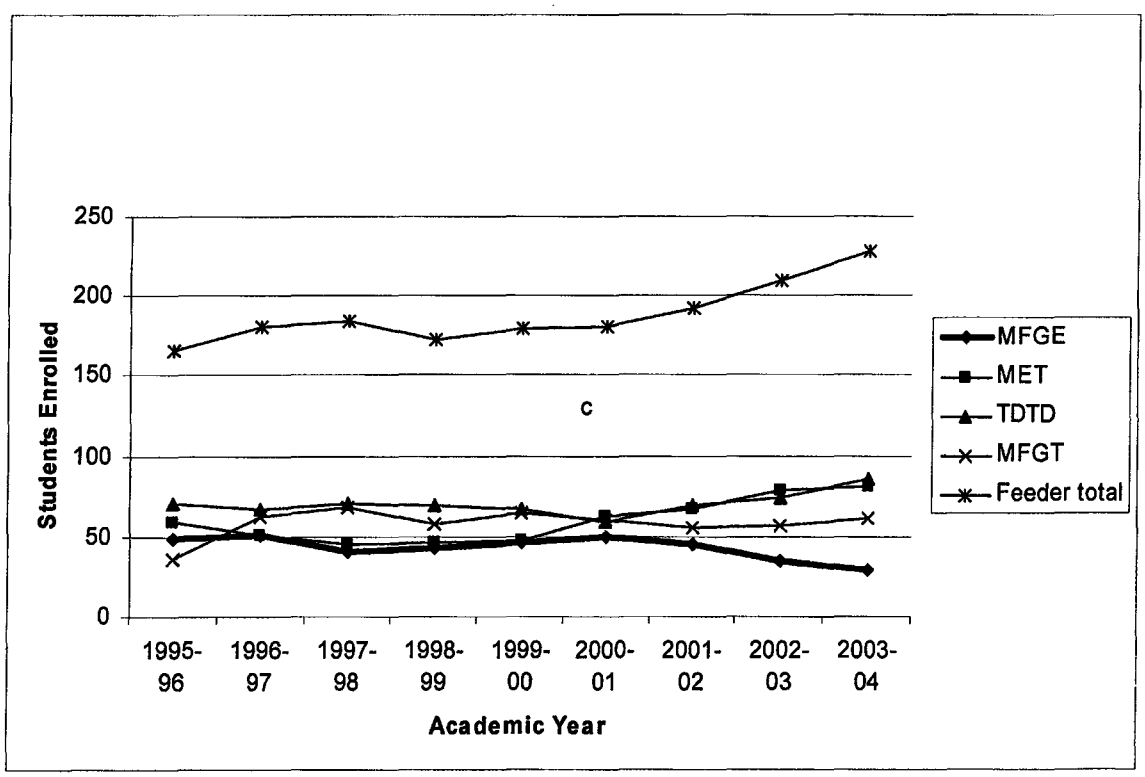
B. ON-CAMPUS ENROLLMENT

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), CAD Drafting & Tool Design (CDTD), 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 between 40 and 45 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' 100% placement rates and "Top Five at Ferris" 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. Only once in the past fifteen 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.

Figure 10-1
Student Enrollment in On-Campus MFGE- and Feeder Programs for Academic Years 1995-96 through 2003-04



Fluctuations in on-campus MFGE enrollment can be attributed to an increase in competition for a static supply of candidates. Common sense told us that when the

Mechanical Engineering Technology program introduced their BS degree that we would lose a significant number of MET AAS students coming into the MFGE BS program, and that has indeed been the case. Whereas prior to the BS-MET program's existence, the MFGE program averaged between 4 and 6 AAS-MET graduates entering each fall, this year (Fall 2004), we admitted our first in several years.

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, poor economic conditions throughout the state, etc.). This realization does not mean that we accept being at the mercy of others' recruiting efforts, though. In past years we conducted joint recruiting trips to high schools with representatives of our feeder programs to encourage students to think several steps ahead in their career planning instead of just one. More recently we have also increased our efforts at key community colleges around the state, with admittedly varied levels of success (so far). We believe that MFGE on-campus enrollment bottomed out in academic year 2003-04, and our increased recruiting efforts will begin to pay better dividends via more- and better-qualified transfer students.

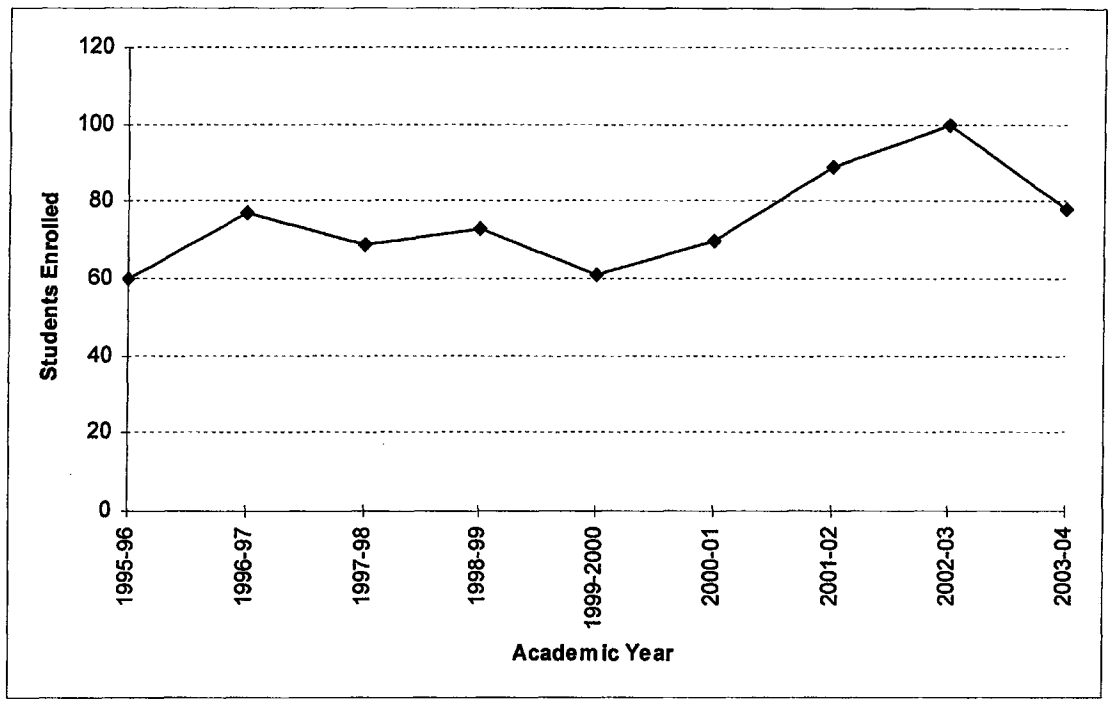
C. OFF-CAMPUS ENROLLMENT

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). Demand remains good for MFGE programming, but several challenges must be met head-on to continue growth against growing competition, both internal and external.

In the field of technical education, the Grand Rapids metro area was ignored for far too long by Ferris' competitors. 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. For example, Grand Valley State University moved their Padnos School of Engineering to downtown Grand Rapids, 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. An internal competitor for students, Ferris – Grand Rapids, through the College of Professional and Technological Studies, markets its BAS- Industrial Technology & Management program to many of the same students that used to automatically enter the MFGE program. 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 1995-96 through 2003-04



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.

Section 11

Program Productivity

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

Because of a College of Technology reorganization, the MFGE prefix listing appears in two places in the productivity report; the MFGE program was part of the Design, Manufacturing, & Graphic Arts (DMGA) Department in the Fall, 2000 reporting period. The Manufacturing Engineering Technologies Department was formed, effective the Winter, 2001 reporting period.

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
1999-00	213	1564	1460	3024
2000-01	162	1484	1405	2889
2001-02	162	1811	1396	3207
2002-03	288	1804	1422	3226

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

Year	Summer	Fall	Winter	Avg (Fall/Winter)
1999-00	1.75	6.38	7.44	6.91
2000-01	1.17	5.47	7.25	6.36
2001-02	1.06	6.41	6.72	6.57
2002-03	1.50	7.08	6.53	6.81

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

Year	Summer	Fall	Winter	Fall+Winter
1999-00	121.71	245.14	196.23	437.62
2000-01	138.46	271.29	193.79	454.25
2001-02	152.83	282.53	207.74	486.13
2002-03	192.00	254.80	217.76	473.72

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, 1999-2002

Category	Mean	Standard Deviation	95% Confidence Interval
SCH	3086.50	160.097	2766.31 to 3406.69
FTEF	6.66	.257	6.146 to 7.154
SCH/FTEF	463.43	22.11	419.21 to 507.65

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

Table 11-5
College of Technology
Ranking of Programs by SCH/FTEF Ratio for 2002-2003

Rank	Program Name	Prefix	SCH/ FTEF*
1	Mechanical Engineering Technology (AAS/BS)	MECH	591
2	Construction Management (BS)	CONM	533
3	Automotive & Heavy Equipment Management (BS)	AHEM	487
4	**Manufacturing Engineering Technology (BS)**	**MFGE**	**461**
5	Building Construction Technology (AAS)	BCTM	459
6	***Ferris State University***		***439***
7	Product Design Engineering Technology (BS)	PDET	416
8	***Manufacturing Department***		***385***
9	HVACR Engineering Technology (AAS/BS)	HVAC	376
10	Heavy Equipment Service Engineering Technology (BS)	HSET	371
11	Automotive Body (AAS)	ABOD	351
12	***College of Technology***		***343***
13	Electrical & Electronics Engineering Technology (AAS/BS)	EEET	342
14	Welding Engineering Technology (AAS/BS)	WELD	337
15	Plastics Engineering Technology (AAS/BS)	PLTS	329
16	Technical Drafting & Tool Design (AAS)	CDTD	304
17	Surveying Engineering (BS)	SURE	296
18	Automotive Service Technology (AAS)	AUTO	291
19	Architectural Technology (AAS)	ARCH	276
20	Heavy Equipment Technology (AAS)	HEQT	274
21	Computer Network and Systems	ECNS	270
22	Manufacturing Tooling Technology (AAS)	MFGT	269
23	Facilities Management (BS)	FMAN	242
24	Printing Technology (AAS)	PTEC	242
25	Civil Engineering Technology (AAS)	CETM	205
26	Rubber Engineering Technology (AAS/BS)	RUBR	186
27	Printing Management (BS)	PMGT	156
28	New Media Printing and Publishing	NMPP	129

Material Science	MATL	577
Engineering Graphics Comprehensive	ETEC	528

* - ratio rounded to nearest whole number

Source: Productivity Report Fall 1998-Winter 2003

This data shows that the MFGE program ranks as fourth best program overall in the College of Technology, second best of all engineering technology programs, far above the College of Technology aggregate productivity level, and above the university aggregate productivity level. Note that the Mechanical Engineering Technology productivity is based upon serving both an AAS and BS program.

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

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 relatively steady for the last decade, although in recent years the program has experienced some decline. 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 13 to 17 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. A limited number of Manufacturing courses are offered at several other sites under the auspices of UCEL.

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, have traditionally fared much better than students from competing schools on internationally recognized certification exams. Computer usage has become an important part of the MFGE program to the point that it has become a "laptop" program, following on the heels of the precedent set by the Product Design Engineering Technology 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 $52,411 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
- MFGE 351 - Intro to Industrial Engineering
- MFGE 352 - Design for Manufacturability
- MFGE 353 - Statistical Quality Control
- MFGE 354 - Lean Manufacturing Principles and Concepts
- MATL 341 - Material Selection Metals
- MFGE 341 - Quality Science Statistics
- 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, and MFGE 451 required)
- BS Welding Engineering Technology (MFGE 353)
- BS Electrical Engineering Technology (MFGE 353 and/or MFGE 423 required or optional, depending on option)
- BS Operations Management (College of Business) (MFGE 351, MFGE 354 and MFGE 451 required)

- BS Automotive Engineering Technology (MATL 240 required, choice of any four of the following - MFGE 313, MFGE 341, MFGE342, MFGE 352, MFGE 442, MFGE 443,MFGE 445)
- 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)

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 2005, the MFGE program has been allotted a total of $18,024. A "life-saver" in recent years, has been the availability of off-campus incentive funds earned by the faculty, as a result of off-campus programming. Program faculty have also vigorously sought out and obtained Meritorious Grants, one-time equipment funds, Faculty Development Grants, Marketing Grants, and Timme Grants.

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, there is a great deal, and ever increasing amount of manufacturing-related information available on the Internet. The opening of FLITE provided an opportunity, working with their personnel to greatly increase the quantity and quality of printed material made available in that facility to serve the program. During the 2003-04 academic year, the program was assigned Swan 101. This room has space that will be dedicated a resource area, as that area goes through a refurbishment process.

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 (Ref Appendix).

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 Manufacturing Department Chair. 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 11 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 and Granger Center startup, a variety of 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

SECTION 13

RECOMMENDATIONS

In former President Sederburg's letter dated September 1, 1998 to the campus community, 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 were incorporated into the FSU Comprehensive Planning Document. Although authored in the late nineties, the issues identified are still relevant today. 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

- Faculty Development

  In recent years, funding has become available at the College and Academic Affairs level to support faculty development efforts. The manufacturing program has accessed these funds to attend workshops, meetings of professional societies, and other events deemed appropriate as contributing to individual and programmatic improvement. This funding needs to be maintained, and as conditions warrant, increased.

- Faculty Recruitment

  Since the last program review period, three faculty members have retired from the MFGE group. These positions have been filled, but not without some difficulty. Administratively, the authorization, posting, and faculty candidate approval process requires streamlining at all levels. Salary and benefit levels need to be established that reflect the market value of potential candidates.

- Programmatic Marketing

  The MFGE program recruits students internally and externally from 2-year associate degree programs. The manufacturing program has requested and received Programmatic Marketing funds, which when pooled with program S & E dollars, has supported a variety of efforts to strengthen program ties to the state community colleges, and promote the program on and off the campus. This marketing program, underwritten by Academic Affairs, needs to be maintained.

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 twenty-one 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. As we are in 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.

- Facilities & Equipment

  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 our less 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. The recommendation for facilities and equipment as submitted by the Academic Program Review Council (November 12, 1998) needs to acted upon. This would facilitate desired improvements to the MFGE core program, service to "relateds", and cross-curricular projects.

- TAC of ABET Accreditation

  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.

- Curriculum Initiatives

  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 improvements integrated into 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.

APRC Recommendations
Manufacturing Engineering Technology
November 12, 1998

Status of these recommendations, as of **September 10, 2004**
X - Implemented, O - Not Implemented
We recommend that the Manufacturing Engineering Technology program be enhanced.

- The program has a number of important strengths:
  - It is central to Ferris' mission.
  - It is superior in quality to its competitor programs at other Michigan institutions.
  - Through placement of graduates, it provides a service to the state and nation.
  - A demand exists for the program by students.
  - Quality of instruction is rated high.
  - Graduates are easily placed at well-paying jobs.
  - The program serves non-majors in other Technology programs.
  - At $139.33 per student credit hour, the program operates at a cost above the average for Ferris degree programs ($127.21).
  - The faculty is experienced and well qualified.

- The following steps need to be taken to maintain the programs high quality:
  - The program should make changes necessary to earn ABET accreditation.
    O
  - APRC recommends that this program develop an associate-degree program in Manufacturing Engineering Technology.
    O
  - In accordance with the program review panel's request, faculty development funding should be made available to faculty in this program.
    X
  - The University should make funds available to reimburse program faculty for recruitment activities.
    X
  - Only Manufacturing Engineering Technology program faculty should advise students in this program, at whatever site.
    X
  - The University needs to make a long-term facilities and equipment investment in this program if Ferris is to be competitive in this area in the future.
    O

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.

Appendix A

MFGE Check Sheet

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

BS Degree Minimum General Education Requirements

(See the General Education webpage at www.ferris.edu/HTMLS/academics/gened/gened.html for details and acceptable courses in each program)

Communications Competence: 12 semester hours

Quantitative Skills: MATH 115 or ACT score

Scientific Understanding: 7/8 semester hours, including at least one lab course.

Cultural Enrichment: 9 semester hours, including at least one course 200 level or higher.

Social Awareness: 9 semester hours, including at least one Foundation course and at least one 300 level or higher.

At least one Global Consciousness (G) course and one Race/Ethnicity/Gender (REG) course (within Cultural Enrichment or Social Awareness).

Meeting all requirements for graduation is the student's responsibility. Your advisor is available to assist you.

Semester credit load will vary dependent upon coursework completed during first two years of related associate degree program. Some courses listed are requirements for graduation and may be taken any time before graduation. Typical student load is 15-18 credits per semester.

THIRD YEAR - FALL SEMESTER			CREDITS/GRADES
MFGE	311	Industrial Engineering	4
MFGE	312	CNC & CAM (for students without this experience)	4
MFGE	313	Computer Applications for MFG Engineers	2
MFGE	341	Quality Science Statistics (**MATH 116 or equivalent**)	3
PDET	322	Model and Prototype Development	2
ELECTIVE			

THIRD YEAR - WINTER SEMESTER			
MFGE	321	Metrology	3
MFGE	322	Production Processes	3
MFGE	324	Tool Engineering (**MFGE 313**)	3
MFGE	326	Process Tolerance and Design Analysis (**MFGE 311 or dept. approval**)	2
MFGE	342	Statistical Process Engineering (**MFGE 341**)	3
ELECTIVE			

THIRD YEAR - SUMMER SEMESTER			
MFGE	393	Internship	4

FOURTH YEAR - FALL SEMESTER			
MFGE	411	Principles of Process Planning (**by permit only**)	2
WELD	416	Welding Processes (may be taken in alternative sequence)	2
MFGE	442	Design of Experiments 1 (**MFGE 341**)	3
MECH	340	Statics and Strength of Materials (**MATH 126, PHYS 211**)	4
ELECTIVE			

FOURTH YEAR - WINTER SEMESTER			
MFGE	421	Automation and Systems Design (**MFGE 411**)	4
MFGE	422	Manufacturing Facilities Planning (**MFGE 411**)	3
MFGE	423	Engineering Economics (**MATH 126**)	2
PLTS	325	Plastics Processes (may be taken in alternative sequence)	2
ELECTIVE			

(OVER)

CURRICULUM REQUIREMENTS
MANUFACTURING ENGINEERING TECHNOLOGY
BACHELOR OF SCIENCE DEGREE
FALL SEMESTER

ENTRY CRITERIA

1. Associate Degree in a Manufacturing-based Technology degree (or 60 semester hours of college course work including technical courses, general courses, and technical related courses).
2. 2.75 grade point average in major courses, or faculty approval.
3. 2.5 grade point average in mathematics, through MATH 116 (or equivalent).

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 AAS degree coursework.

TECHNICAL		CREDIT HOURS	STATUS
MFGE 311	Industrial Engineering	4	
MFGE 312	CNC & CAM	4	
MFGE 313	Cmptr Appl for MFG Eng.	2	
MFGE 321	Metrology	3	
MFGE 322	Production Processes	3	
MFGE 324	Tool Engineering	3	
MFGE 326	Prcs Tolerance/Dsgn Anal	2	
MFGE 341	Quality Science Statistics	3	
MFGE 342	Stat Process Engineering	3	
MFGE 393	Internship	4	
MFGE 411	Prin of Process Planning	2	
MFGE 421	Automation & Sys Dsgn	4	
MFGE 422	Mfge Facilities Planning	3	
MFGE 423	Engineering Economics	2	
MFGE 442	Design of Experiments 1	3	
Technical Related			
MECH 340	Statics & Strg of Matl	4	
PDET 322	Model & Prototype Dev	2	
PLTS 325	Plastic Processes	2	
WELD 416	Prod Welding Processes	2	

GENERAL EDUCATION (May be taken in AAS program)		CREDIT HOURS	STATUS
Communication Competence			
ENGL 150	English 1	3	
ENGL 250	English 2	3	
OR			
ENGL 211	Career/Technical Writing	3	
MFGE	Writing Intensive Core	3	
COMM 121	Public Speaking	3	
Scientific Understanding			
PHYS 211	Intro Physics 1	4	
Elective		3-4	
Quantitative Skills			
MATH 216	Applied Calculus	4	
Cultural Enrichment			
Directed Elective		3	
Directed Elective (200 or higher)		3	
Social Awareness			
PSYC 150	Intro Psyc	3	
Directed Elective (300 or higher)		3	

Ferris State University
Graduation Check Sheet for General Education Requirements

4/3/01

(See 2000-2002 FSU Catalog for details)

Associate in Applied Science (A.A.S.)

		Course	Credit Hours
I. Communication Competence (6 credit hours):			
A. English 150	(√)	_____	3
B. English 250 or English 211		_____	3
II. Scientific Understanding (3 credit hours):			
Choose one general education course with a lab: ASTR, BIOL (except BIOL 207, 307), CHEM (except CHEM 307), GEOG 111, GEOG 121, GEOL, PHSC, PHYS.		_____	____
III. Quantitative Skills			
Complete one of the following options:			
A. Pass MATH 110 or higher.	(√)	_____	
B. Pass a course proficiency exam for MATH 110 or higher; or	(√)	_____	
C. Submit an ACT math subtest score of 19 or higher + 2 years of high school algebra with grades of C- or better.	(√)	_____	
D. Submit an ACT math subtest score of 22 or higher + 1 year high school algebra with a grade of C- or better.	(√)	_____	
IV. Cultural Enrichment (3 credit hours):			
Choose one general education approved course: ARCH 244, ARTH, ARTS, COMM 231 ENGL 322, FREN, GERM, HIST, HUMN, LITR, MUSI, PHOT 101, SPAN, THTR.		_____	____
V. Social Awareness (3 credit hours):			
Choose one general education approved course: ANTH, ECON, PLSC, PSYC, SOCY, GEOG (except GEOG 111, 121 and 421), SSCI.		_____	____

Bachelor of Science (B.S.) – Manufacturing Engineering Technology

I. Communication Competence (12 credit hours):				
A. English and speech communication:				
1. ENGL 150			ENGL 150	3
2. ENGL 250 or ENGL 211			ENGL 250	3
B. Choose one: COMM 105, COMM 121, COMM 221 or COMM 251			COMM 121	3
C. Advanced ENGL, WIC, COMM, complete one of the following options:				
1. ENGL 311, 321, 323 or 325			_____	____
2. Two "Writing-Intensive Courses" (WIC) plus one COMM course at the 200 level or higher.	_____	_____	_____	____
3. Three WIC courses.	MFGE 324	MFGE 393	MFGE 421	3
See WIC course definition and listing in "Courses Meeting General Education Category Requirements."				
II. Scientific Understanding (7 credit hours):				
Choose two general education approved courses, one with a lab: ASTR, BIOL (except BIOL 207, 307), CHEM (except CHEM 307), GEOG 111, GEOG 121, GEOL, PHSC, PHYS.		(lab)	PHYS 211	4
III. Quantitative Skills:				
Complete one of the following options:				
A. Pass MATH 115 or higher;		( )	MATH 126	4
B. Pass a course proficiency exam for MATH 115 or higher; or		( )	MATH 216	4
C. Submit an ACT math subtest score of 24 or higher +1 year of high school algebra with a grade of C- or better.		( )	_____	
IV. Cultural Enrichment (9 credit hours):				
Choose three general education approved courses with at least one course at the 200 level or higher; no more than 5 credit hours in music activities or theater activities courses: ARCH 244, ARTH, ARTS, COMM 231, ENGL 322, FREN, GERM, HIST, HUMN, LITR, MUSI, PHOT 101, SPAN, SURE 331, THTR.		*G R G R (200+) G R	_____ _____ _____	____ ____ ____
V. Social Awareness (9 credit hours):				
Choose three general education approved courses in at least two different subject areas, one social awareness foundation course, one course dealing with issues of race/ethnicity and/or gender, and one course at the 300 level or higher: ANTH, ECON, PLSC, PSYC, SOCY, GEOG (except GEOG 111, 121 and 421), SSCI.	(300+)	*F R F G R F G R	PYSC 150 _____ PSYC 326	3 3 3

VI. Global Consciousness *

Each student must complete one course from the global consciousness group that may also count toward fulfilling the cultural, languages, and societies outside North America or with contemporary Native American culture and civilization: ANTH 122, ECON 311, 312, 451, FREN 100, 101, 102, 201, 202, GEOG 100, 112, 202, 421, 424, GERM 101, 102, 201, 202, HIST 320, 341, 360, 371, 372, 373, 375, 385, HUMN 240, 325, INTB 310, LITR 203, 300, 301, 302, 303, 304, 305, 330, MGMT 377, MKTG, 441, PLSC 323, 331, 341, SOCY 225, 344, 460, SPAN 101, 102, 201, 202, 301, 302, 331, 332, 333, SSCI 201

***Circle all that apply: (F) for Social Awareness Foundation, (R) for Race/Ethnicity and/or Gender, (G) for Global Consciousness.**
Note: Zero-level courses (010, etc.) do not count either as credit toward graduation or for general education requirements.

Ferris State University
College of Technology
Manufacturing Department

Manufacturing Engineering Technology

Programs Offered: B.S. Degree In Manufacturing Engineering Technology, Established in 1977.
B.S. Degree in Quality Engineering Technology, Established in 1996.
Certificate Quality Technology - Advanced Technical Studies Series

Faculty Background: Faculty have expertise in all phases of manufacturing engineering including such areas as: design, processing, quality assurance, facilities layout, machining, metallurgy, CNC, CAD, CAM, automation and computer applications, as well as product manufacturing.

Program Highlights: 2 + 2 program structure. Bachelor of Science Degrees in Manufacturing Engineering Technology and Quality Engineering Technology are also offered in Grand Rapids, MI at the Applied Technology Center for part-time continuing education students.

Employment Opportunities: 100% of all graduates employed upon graduation in their technical field. Starting salaries are consistently in the top 5 from Ferris State University.
Job description titles of graduates include: Manufacturing Engineer, Design Engineer, Quality Engineer, Industrial Engineer, Manufacturing Cost Estimator, Tool Engineer, Process Engineer, Manufacturing Engineering Manager, Plant Manager, Quality Manager, Project Manager, Vice President of Operations, President, and Superintendent of Operations.

Employers: Ford, Chrysler, General Motors, Steelcase, Hughes Tool, Rockwell International, IBM, Prince Corporation, Howmet, Sealed Power, Modine Manufacturing, Nippon Denso, ITT Industries, Delco Electronics, Simpson Industries, Drawform, Federal Mogul, EDS Corp.

Salaries: 2001 salaries for new graduates as reported: Average $51,326, Median $50,099.

Transfer Requirements: A.A.S. Degree in one of the following: Mechanical Engineering Technology, Manufacturing Tooling Technology, Technical Drafting/Tool Design, Plastics Technology, Welding Technology, Those with other equivalent two-year A.A.S. Degrees or 60 semester hours of technical, technical related and general course work, may apply for transfer.

Admission Requirements: 2.75 honor point average in major study area plus a 2.50 honor point average in mathematics (through Math 126).

Scholarships: Educational scholarships are available from, but not limited to: Society of Manufacturing Engineers, Paragon Die and Engineering, Cascade Engineering, and The American Institute of Plant Engineers.

Contact:
Gary Ovans, Department Chair
Ferris State University
Manufacturing Department
915 Campus Drive, Swan 108
Big Rapids, MI 49307
231/591-2511
FAX 231/591-2407
E-Mail: ovansg@ferris.edu

Ferris State University
Manufacturing Engineering Technology

Student Laptop Requirements

The Ferris State University Manufacturing Engineering Technology program is a "laptop" program. Students entering the program need to bring a laptop with them. The following is a list of specifications that your computer must meet to be able to utilize programmatic-specific software. Student financial aid is applicable for the purchase a laptop computer.

Recommended:

1. **Operating system: Microsoft Windows XP Home or Professional Edition.**
2. **Processor: Intel Pentium 4, CPU 2.4GHz, Memory 512MB DDR RAM**
3. **Hard Drive: 40GB**
4. **Graphics Card: 64MB DDR NVIDIA GeForce4 MX**

Minimum:

1. **Operating System: Microsoft Windows XP/2000**
2. **Processor: Intel Pentium 3, CPU 650MHz, Memory 256MB RAM**
3. **Hard Drive: 20GB**
4. **Acceptable Graphics Cards (Open GL compliance required)**

a. **32MB NVIDIA GeForce series**
b. **32MB NVIDIA RIVA TNT 2**
c. **Other graphics card compliant with Microsoft Open GL**

NOTE: ATI cards are not (currently) compliant with Microsoft's standard implementation of OpenGL (per Flexsim)

If you have any questions, please contact:
Gary Ovans, Department Chair
Manufacturing Department
Ferris State University
915 Campus Drive, Swan 108
Big Rapids, MI 49307
Phone: 231-501-2071
E-mail: ovansg@ferris.edu

March 2004

Appendix B

Faculty Resumes

Blaine R. Danley
15830 65th Ave.
Mecosta, MI 49332

OBJECTIVE

Apply my educational and professional experience to teach material science, welding and manufacturing engineering to undergraduate students.

EDUCATION

May 1991 **M.S., Metallurgical and Materials Engineering**
Michigan Technological University, Houghton, MI

May 1988 **B.S., Metallurgical and Materials Engineering**
Michigan Technological University, Houghton, MI

PATENTS

- Awarded U.S. Patent # 6,565,723, ISOLATED GROUND SENSOR ACHIEVED USING ALUMINA COATING OVER SPINEL (May 20, 2003)
- Awarded U.S. Patent # 6,613,468, GAS DIFFUSION MAT FOR FUEL CELLS (September 2, 2003)

EXPERIENCE

August 2000 – present **Ferris State University**
Big Rapids, MI

Assistant Professor, Manufacturing Engineering Technology

- Primary responsibility is to teach Material Science classes including MATL 240, MATL 341, and WELD 422
- Develop and update course content for Material Science classes
- Obtain funding, specify, purchase, and maintain equipment in the Material Science Laboratory
- Advise students

June 1997 – August 2000 **Delphi Automotive Systems**
Flint, MI

Senior Manufacturing Engineer

- Developed materials and manufacturing process for solid oxide fuel cells
- Evaluated fuel cell designs for reliability, cost, and ease of manufacturing
- Developed plasma spray process to apply protective coating on oxygen sensor elements
- Designed, installed, and qualified plasma spray equipment for oxygen sensor production
- Evaluated accelerated durability test results for oxygen sensors

EXPERIENCE, continued

June 1995 – June 1997

General Motors Corporation
Delphi Automotive Systems, Flint, MI

Senior Experimental Metallurgist

- Developed and taught beginning and advanced courses on welding engineering to process engineers within General Motors
- Evaluated and specified equipment for metallurgical laboratory and supervised lab personnel
- Performed failure analysis on automotive components from accelerated tests and field failures
- Developed materials and procedure to weld nodular cast iron to stainless steel for exhaust application
- Specified and evaluated materials for automotive exhaust systems

June 1992 – June 1995

General Motors Corporation
AC Rochester Division, Flint MI

Process Development Engineer

- Troubleshoot welding processes involving GMAW, GTAW, plasma, and resistance welding
- Programmed robots for various welding and part handling applications
- Applied "Design of Experiments" methodology to study various manufacturing processes
- Performed metallurgical analysis of components to qualify production equipment/processes

June 1991 – June 1992

General Motors Corporation
AC Rochester Division, Flint, MI

Associate Engineer

- Assigned to National Institute of Standards and Technology (NIST) in Boulder, CO to co-develop a system to monitor GMAW and GTAW processes
- Implemented GMAW and GTAW process monitoring on production equipment
- Presented paper at AWS Conference "Commercialization of Advanced Joining Technology Through Industry-Government Partnering"

September 1989 – June 1991

Michigan Technological University
Houghton, MI

Graduate Research Assistant

- Completed thesis on *"A TEM Study on the Morphological Stability of Polycrystalline Thin Films"*
- Performed TEM and SEM analysis of thin films
- Produced thin films using sputtering and CVD techniques

November 1988 – August 1989

Howmet Corporation
Wichita Falls Casting Div., Wichita Falls TX

Plant Metallurgist

- Responsible for calibration and certification of metallurgical lab equipment to commercial and military aircraft engine specifications
- Supervised metallurgical laboratory personnel
- Responsible for vacuum heat treatment department

EXPERIENCE, continued

June 1988 – November 1988

Howmet Corporation
Whitehall Casting Div., Whitehall, MI

Associate Metallurgist

- Trained in manufacturing methods to produce super alloys for investment casting
- Trained in all aspects of investment casting equiaxed, directionally solidified, and single crystal aircraft engine turbine parts including molding, casting, heat treatment and inspection

ADDITIONAL TRAINING

- Moderated graduate level courses for General Motors "Technical Education Program"
  - Materials in Design and Manufacturing, *University of Michigan*
  - Welding and Joining, *Massachusetts Institute of Technology*
  - Manufacturing Processes, *Columbia University*
- DFMEA, PFMEA
- Design of Experiments (DOE), Shanin
- Statistical Process Control
- Robotics (Motoman, Fanuc, Panasonic)
- Member ASM International
- Chair of Membership Committee for ASM International
- Member American Welding Society

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 Statistics, Design of Experiments, Principles of Process Planning, Tolerance Control, Engineering Economics

Services to Industry (7 year window)

- 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 & '96

Service to Industry Continued

- Delivered the seminar titled, "Manufacturing Engineering Essentials" along with two colleagues for Grand Valley State University (winter 1998)
- Developed and delivered a customized Statistics/Design of Experiments course for Rexair, Inc., Cadillac, MI. (summer/fall 1998)
- Developed and delivered a basic Process Capability training course for Frigidaire, Greenville, MI (winter 1999)
- Developed and delivered SPC course for Ice Mountain (2002)

Services to University (7 year window)

- Tenure Policy Review Committee. Helped in streamlining and rewriting the department tenure policy; 1997-1998.
- Tenure Track Faculty Tenure Committees:
    - Larry Langell's tenure committee. Larry was granted tenure winter 200?)
    - Served on Larry Shult's tenure committee. Larry was granted tenure winter 1998.
    - Served on Mark Rusco tenure committee. Mark was granted tenure winter 2003
    - Serve as Joe Wist's tenure committee chair (current)
    - Blaine Danley (current)
- Mentored: Mark Rusco (1999-2000), Blaine Danley (2000-2001), Joe Wist (2001-2002);
- Advisor to the student chapter of the Society of Manufacturing Engineers (SME); Joe Wist is assuming this duty as of 2003.
- Served on President Sederburg's 2020 Vision Committee; Co-Chair with Randy Vance.
- Serving on curriculum review committee for manufacturing engineering technology program; (current)

Scholarly Activity (7 year window)

- 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

- Very active in the Adventure Ministries arm of Power House Student Ministries at Trinity Fellowship Church, Big Rapids, MI. (current)
- Hire 25 Jr. & Sr. high school students annually (May-June) to hand harvest 50 acres of asparagus.

Workshops and Seminars Attended, College Course Work Completed

- Programmable Logic controllers; Allen Bradley Corp. Sponsored by Grand Valley State University. Fall 1997.
- Response Surface Methods; StatEase Corporation. Minneapolis, MN. Summer 1997.
- Differential Equation; (MATH 330); Ferris State University (W99); Grade: A-
- Linear Algebra; (MATH 322); Ferris State University (F99); Grade: A
- Three Dimensional Solid and Parametric Modeling (CDTD 390); FSU (W01); Grade A
- Introduction to Chemistry; (CHEM 103); Ferris; (F01); Grade A

Gary L. Ovans

15882 Belmont Dr. **(231) 796-6582**
Big Rapids, MI 49307

Professional Objective:

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

Education

Degrees: M.S. Degree: Occupational Education, 1991, Ferris State University
B.S. Degree: Industrial Technology, 1976, UW-Stout
B.S. Degree: Physics and Sociology , 1975, UW Eau Claire

Coursework Taken for Credit:

WEL-489 Topics In Welding, Summer Quarter, 1986
MFG-489 Special Topics In Manufacturing, Summer Qtr., 1987
MFGE-330 Computer Applications for Manufacturing, Summer Qtr., 1992
Quality Technology Certificate:
-MFGE-341 Quality Science Statistics, Spring Qtr., 1993
-MFGE-342 Statistical Process Engineering, Summer Qtr., 1993
-MFGE-442 Design of Experiments, Fall Semester, 1993
-MFGE-443 Continuous Improvement, Winter Semester, 1994

PLTS-290 Plastics and Elastomers, Fall Semester, 1998
CISM-505 Internet As An Instructional Resource, Fall Semester, 2001
MFGE-490 Quality Planning, Winter Semester, 2002
MFGE-444 Quality Auditing, Fall, 2002

Seminars and Workshops Attended:

-Laser based Vision Systems Seminar/Workshop, Michigan State University, 1987
-Methods of Experimentation Workshop (DOE, Taguchi Methodology), FSU, May 1988
-Manufacturing Engineering Faculty Enhancement Workshop, National Science Foundation through U. of Michigan-Dearborn, Summer, 1988
-Application and Implementation of Conveyor Systems Workshop, Society of Manufacturing Engineers, Toronto, Canada, Oct., 1988
-Beginning DOS for IBM PC Workshop, FSU, May, 1989
-Super Abrasives For Educators Seminar, Henry Ford Community College, Oct., 1989
-MAPICS Product Data Management, Lansing Community College, January, 1990
-MAPICS Inventory Management, Lansing CC, February, 1990
-Stata Matrix ISO-9000 Lead Assessor Workshop, Minneapolis, MINN, 1993
-Metrology Seminar, Burton Precision, Grand Rapids, MI, 1995

-Material Handling Teachers Institute, Montana State University, Bozeman, MT, 1995
-Summer Faculty Institute, FSU, Jun. 13, 1996
Awarded **$1,000** for program equipment.
-Statistical Process Control, Frigidaire Corp., Feb., 1997
-Stat-Ease Design of Experiments, Mpls., Minn., Jun. 3-6, 1997
-Measure-Up Metrology Workshop, Madison, WI, Feb., 1999
and Refresher, Feb., 2000, 48 hrs.
-PowerPoint Training, FSU, August 17, 1999
-Geometric Dimensioning and Tolerancing Workshop, Technical Documentation Consultants, Ridgecrest, CA, Jan. 24-28, 2000
-West Point Teaching Methods, FSU, Jan. 3, 2000and Effective Proposal Writing, Feb. 11, 1999
-Computer Numerical Programming Workshop, Purdue University through Parkland College, Champaign, Ill., Jun. 13-16, 2000
-Application of Teaching Methods, FSU, Winter Sem.,2001Awarded **$500** for program equipment
-Trends In Occupational Studies Conference, Nov. 1-2, 2001
-Technical Tooling Seminar, Sandvik Coromant, Feb. 27, 2002
-Ferris Summer University, Jun. 3-6, 2002
-Effective Grading Workshop, FSU, July 24, 2002
-Foundation Blocks For Lean Manufacturing, Society of Manufacturing Engineers, August 18-22, 2003
-Presenter, ASEE Conference for Industry and Education Collaboration, Biloxi, Mississippi, February 3-5
-Developer, Case Files Implementation Institute, Nashville, Tennesee, February 22-26, 2004
-Quick Response Quoting and Manufacturing Certificate Program, Society of Manufacturing Engineers, Dearborn, MI, August 24-26, 2004

Work Experience

August, 1999 to Present

Dept. Chair, Manufacturing Dept. , College of Technology, Ferris State U.

- Perform administrative duties 75 % load as outlined in **Position Description Academic Department Chair,** dated April 12, 2000. Responsible for activities related to operation of department academic programs on the FSU main campus, and as offered at the Applied Technology Center in Grand Rapids, MI. Programs as follows: B.S. Manufacturing Engineering Technology, B.S. Quality Engineering Technology, A.A.S. Manufacturing Tooling Technology, Material Science.
- Teach at 25% load.

September, 1996 to August 1999

Program Coordinator, Manufacturing Program, College of Technology, FSU

- Perform program administrative duties at 50 % load for the Manufacturing Engineering Technology program offerings on the FSU main campus, at the Applied Technology Center in Grand Rapids, and at remote sites as required by the Metal Stamping option of the MET degree.
- Perform administrative duties as required for Quality Engineering Technology B.S. and Material Science offerings.
- Teach coursework at 50% of load.

August 1984 to September, 1996

Academic Faculty, Manufacturing Engineering Technology, COT, FSU

- Teach coursework in the Manufacturing Engineering Technology B.S. program.
  - Main campus, Applied Technology Center, and at remote sites via distance learning.
  - Teach course work to related programs.
  - Teach overloads as necessary.
- Advise students on main campus, Applied Technology Center and at community colleges.
- Serve on program, department, college, and university-wide committees.

Courses Taught:

Manufacturing and Quality* Engineering Technology Core Classes:

- MFG 311 Production Machining Processes
- MFG 312 Production Press-working Processes
- MFG 321 Principles of Process Planning l
- MFG 333 Manufacturing Cost Estimating
- MFG 351 Tool Design for Manufacturing
- MFG 413 Production Welding Processes
- MFG 422 Computer Aided Process Planning
- MFGE 311 Industrial Engineering
- MFGE 321 Metrology*
- MFGE 322 Production Processes
- MFGE 324 Tool Engineering (writing intensive)
- MFGE 326 Process Tolerance design and Analysis
- MFGE 341 Quality Science Statistics*
- MFGE 342 Statistical Process Engineering*
- MFGE 393 Internship (writing intensive)
- MFGE 411 Principles of Process Planning
- MFGE 422 Manufacturing Facilities Planning

- MFGE 499 Capstone Experience

Relateds:

- MFGE 351 Intro to Industrial Engineering
- MFGE 352 Design for Manufacturing
- MFGE 353 Statistical Quality Control
- MFGE 451 Intro to Plant Engineering (Facilities and Automation)

Committee Membership:

- Academic and Administrative Computer Activities Steering Committee, 1987-1988
- Student Activities Budget Advisory Committee, 1988-1989
- Academic Senate, 1990-1992
- College of Technology CIM Taskforce, 1991-1992
- College of Technology Promotion Committee, 1992-1993
- Arts and Lectures Committee, 1995-1997
- Academic Program Review Council (Academic Senate). 1996-1999
- Dept. Curriculum Committee (on-going)
- Faculty Tenure Committees (on-going)
- Academic Program Review for Manufacturing Engineering Technology, 1998, and Quality Engineering Technology, 2001

Seminars and Workshops Conducted:

-Methods Improvement and Analysis, Carlon Meter, Grand Haven MI, 1985
-Noise Level Analysis Project, Morbark Industries, Winn, MI 1985
-Plant Layout and Material Handling Project, Polycore Inc., Crystal MI, 1987
-Gage R & R Evaluation of Prototype Gaging, Cascade Engineering, 1988
-Plant Layout/Material Handling Project, Metal Standard Corp., Holland, MI, 1988
-Automation Feasibility Study, Kysor Corp., Rothbury, MI, 1988
-Plant Layout Documentation and Analysis Project, Grand Haven Stamped Products. Grand Haven, MI 1988
-Manufacturing Engineering Workshop for Costa Rican Industrialists through FSU International, May, 1990
-Motion and Time Study Workshop for Fitzsimmons Manufacturing, Big Rapids, MI, July and August 1990
-Motion and Time Study Workshop, Grand Rapids Controls, August, 1990
-ISO-9000 Executive Overview Seminar through FSU TTC, 1993
-Statistical Process Control Workshop for Fitzsimmons Manufacturing, Big rapids, MI, 1994
-Statistical Process Control Workshop for Lobdell Emory Corporation through Montcalm Community College, 1995
-Industrial Engineering Workshop, The Knoll Group Furniture Division, Grand rapids, MI, 1996
-Engineering Essentials Seminar, SAE, Troy, MI, 1-24-96, 5-13-96, 9-20-96 11-20-96
-Statistical Process Control Basics Workshop, Lobdell-Emory Corp., Alma, MI, 1997

-Quality Engineering Essentials Seminar, SAE Headquarters, Troy, MI, 2-25-97, 8-22-97, 3-20-98, May 98 (Grand Valley State, Eberhardt Center), 9-30-98, & 99
-Process Tolerance Charting and Advanced Product Quality Planning (APQP) Seminar Kellogg-Crank Corp., Jackson, MI, November, 1999
-APQP Workshop, Dura-Automotive Inc., Mancelona, MI, Aug., 2000
-Gage Calibration Practices Workshop through FSU TTC, Soo Plastics, Ste. Sault Marie, MI, Jun. 2001

Industrial Experience:

1976 to 1984

Process Engineer, Production Engineer, Manufacturing Engineer at Chrysler Marine (Hartford, Wis.), FMC Corp. (Port Washington, Wis.), Harley Davison Motor Co. (Milwaukee, WI), Waukesha Bearing Corp. (Antigo, WI).

- Capital equipment justification.
- Manufacturing process design.
- Liaison with outside contractors.
- Plant layout.
- Plant floor trouble-shooting and process improvement.
- Supervision.
- Project Management.
- N/C programming.

Professional Affiliation

Member of the **Society of Manufacturing Engineers** since 1984. Currently hold ranking as a **Senior Member**. Awarded certification as **Certified Manufacturing Engineer** through examination in 1985. Certification maintained through a program of continuous professional development.

Member of **American Society of Engineering Educators**

Waterworks Treatment Plant Operator, Wisconsin certification # 11156

Military Experience

- 4 years active duty in electronic intelligence.
  - Service at remote sites overseas and continental U.S.
- 17 years active reserve duty as combat aircrew, worldwide service on C-130 Hercules aircraft.
  - Search and Rescue
  - Support natural disaster relief efforts
  - Provide joint operational support for Army and Navy special operations units
  - Provide logistical support for embassy operations, drug interdiction, and other activities as required by U.S. foreign policy

Military Experience Continued:

- Schools attended:
  - Electronic Intercept, basic and advanced systems
  - C-130 basic and advanced loadmaster training
  - Water Survival
  - Arctic Survival
  - Basic Survival/POW
  - Field Rigging (parachute)
  - Effective Writing
  - Air Force Management

Activities, Interests, and Hobbies

- Assistant Scoutmaster, Troop 114, Big Rapids, MI
- Boy Scout Merit Badge Counselor
  - Space Exploration
  - Fishing
  - Aviation
  - National Heritage
  - Wildlife
- 4-H Adult Leader in Aerospace and Rocketry
- Fishing, opera and Broadway shows, reading, hunting, gardening, wildlife habitat improvement, scuba diving
- Member in good standing of Chapel of The Lakes Lutheran Church

Home:
17315 Outer Drive
Big Rapids, MI 49307-9049
(231)796-0962
jim_rumpf@hotmail.com

Office:
Swan 108, 915 Campus Drive
Big Rapids, MI 49307-2291
(231)591-3591
rumpfj@ferris.edu

JAMES A. RUMPF

EDUCATION

June 1982 — Bachelor of Science in 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 coursework in Ph.D. programs in Industrial Engineering at Western Michigan University, Kalamazoo, MI, and Colorado State University, Fort Collins, CO

EXPERIENCE

August 1990-present — Ferris State University, Manufacturing Engineering Technologies Dept.
Swan 108, 915 Campus Drive, Big Rapids, MI 49307-2291

Employed as Associate Professor in the Manufacturing Engineering Technology program.

Main responsibilities include teaching junior- and senior-level courses in such subjects as automation & system design, computer applications, industrial engineering, plant layout, metal stamping processes, cost estimating, simulation and engineering economics, as well as consulting with local industry. Student advising, lab development/maintenance, course development, and applied research/ publishing are other major duties.

August 1987-April 1990 — Society of Automotive Engineers, Inc.
400 Commonwealth Drive, Warrendale, PA 15096

Employed as Staff Engineer-Land & Sea Technical Division.

Responsibilities included providing staff engineering services to technical committees for various areas of the ground vehicle industry (particularly manufacturing technologies), overseeing referee materials, engineering aids, and product performance review programs (such as the Lubricant Review Institute), and reporting on SAE activities to various directing boards and other

organizations such as ISO and ANSI. Also worked with several board-level committees on such topics as computerization and international harmonization. This position required an understanding of all aspects of the ground vehicle design and production, as well as extensive travel for meetings with all levels of auto- and aerospace company executives from design engineers to vice presidents of engineering.

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 Manufacturing Engineer.

Responsibilities included planning and initiating factory automation and plant facilities projects, then performing the duties associated with project conception and design through equipment specification, fabrication, and installation to start-up and troubleshooting. All phases of project management, as well as mechanical and electrical design, were performed. Traveled to many different GM and vendor sites and became familiar with many different aspects of manufacturing. Made numerous presentations to senior managers for information update and business planning. Worked concurrently with GM Tech Center staffs on a variety of subjects including automation, robotics, production process/DFMA, project appropriations and budgets, and plant modernizations. Also assumed duties of Area Manager of Rear Door and Tailgate Assembly, responsible for production, maintenance, technical support, and direct supervision of hourly personnel.

August 1977-
April 1982

Fisher Body Division, General Motors Corporation, Pittsburgh Plant.

Employed as a Cooperative Education Student.

Gained experience through work assignments in each department of the plant and the Manufacturing & Development Staff at the GM Tech Center in Warren, MI. This provided me with thorough exposure to many business aspects of the auto industry.

PROFESSIONAL SOCIETIES

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

REPRESENTATIVE SAMPLE OF MAJOR PROJECTS FOR INDUSTRIAL CLIENTS WHILE AT FERRIS STATE UNIVERSITY (PROPRIETARY WORK NOT INCLUDED)

Types of Projects	Companies
Plant layout/rearrangement for improved product flow and space utilization	Nicholas Plastics, Grand Haven Furniture Products, Transmatic
Custom course development and delivery	
• Waste Reduction/Lean Manufacturing	Frigidaire
• CAD	IBM
• FMEA	Diesel Technology, Frigidaire, Grand Traverse Stamping, Dura Automotive
• Motion & Time Study	Lacks, Knoll Group
• Robotic applications	Sandmold Systems, Donnelly
• Metalworking processes	IMI
• Automation systems (via CBT)	Fiamm
• Poka-Yoke/Problem Solving	Dura Automotive
• Quality Function Deployment	Fastco
• Theory of Constraints	Dura Automotive
ISO 9000 documentation of production process procedures	Haworth

Mark S. Rusco

16383 Warner Street
Grand Haven, MI 49417
(616) 846-9773 (H)
e-mail mrusco@novagate.com

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 tenured professor in the Manufacturing and Quality Department. I teach classes with an emphasis on quality and manufacturing systems, such as Statistics, Continuous Improvement, Reliability, Industrial Engineering, DOE, 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 wrote 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, 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 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)

Measurement Uncertainty (Instructor)

References

References are available upon request.

Joseph A. Wist

905 Fairmount
Grand Rapids, MI 49506
(616) 233-4733 home

Education:

Michigan Technological University
Houghton, MI
Master of Science in Metallurgical Engineering - received April 1992
Bachelor of Science in Mechanical Engineering - received May 1989

Experience:

Assistant Professor (Jan 2001 – Present)
Manufacturing Engineering Technology
Ferris State University

Courses: Manufacturing Processes, Statistical Process Control, Design for Manufacturing, Material Selection & Design of Metals, Engineering Economics

Manufacturing Engineer
BentelerAutomotive (June 1999 – December 2000)

- Provided front line support for the high volume production of side impact door-beams for General Motors, Chrysler, Ford, Toyota, etc.
  - ⇒ Increased productivity in the 12 weld cell assembly stations ~ 7 % through improvement in assembly tooling, floor management, and troubleshooting to keep production running.
  - ⇒ Involved in all production related corrective actions. Including determining the root causes and implementation of corrective measures
  - ⇒ Trouble-shooting of tooling and assembly components and processes on a daily basis to ensure acceptable assemblies were being produced.
  - ⇒ On a daily basis reviewed all scrap produced and initiated corrective actions and poka-yokes to decrease scrap
- Lead tooling design and build for BMW Seat Belt Anchor tooling.
  - ⇒ Determined new clamping and component presentation schemes to increase tool repeatability

Manufacturing Engineer
MacDonald Industrial Products (March 1998 – June 1999)

- Performed all aspects of engineering support for low pressure and high pressure aluminum die cast and secondary operations
  - ⇒ Reduced low pressure die cast scrap from 9% to 6% on largest low pressure product
  - ⇒ Daily involvement in resolution of quality and production issues
  - ⇒ Eliminated the need to 100 % inspect parts at 2 operations for the largest aluminum die cast customer, through continuous improvement and error proofing
  - ⇒ Increased polishing productivity for zinc window surround from 460 pieces per cell to 530 pieces per cell
- Managed tool room helping facilitate die repair and preparation for production.

Manufacturing Engineer - G.M. Powertrain Bay City (Sept. 1995 – Feb. 1998)
Welding Engineer- G.M. Lansing Automotive Div.
Aerotek Contract Engineering Services

Die Cast

- Provided all aspects of engineering support for production of die cast transmission components
  - ⇒ Determined and implemented process and process monitoring systems
  - ⇒ Initiated the use of new die cast lubricant resulting in increases of productivity of 25%
  - ⇒ On a daily basis determined root causes of scrap and implemented corrective actions
  - ⇒ Supported tool room in determining degree of die repair required and interpretation of CMM results
  - ⇒ Performed all aspects of purchasing for replacement tooling, equipment, and stores setup
- Assisted in developing and implementing a die repair and approval process to meet QS 9000 requirements.
- Managed the pre-production approval of die cast dies
  - ⇒ Coordinated die sampling, gage room CMM data collection for dimensional analysis, and machining of samples to facilitate PPAP approval of dies
  - ⇒ Initiated outside sampling of dies, thereby eliminating the need to break into production schedules
  - ⇒ Tracked die build, die approval, and visited vendor sites to review progress and resolve open issues.

Welding

- Performed tooling verification of resistance spot welding (RSW) robotic, hard tooling, and manual welding stations within construction sources
  - ⇒ Interacted with process engineers and build sources to facilitate tool construction and compliance to General Motors weld tooling standards
  - ⇒ Developed and authored weld tool verification procedures

Publications

"Electrode-Workpiece Sticking on Electrogalvanized Steel, "J.A. Wist, C.L. White, M.D. Gugel: SheetMetal Welding ConferenceVII; American Welding Society; Detroit, MI; Oct. 9, 1996

"The Influence of Resistance Spot welding Electrode Alloy Type on the Nature of Electrode and Tip Life", J.A. Wist, C.L. White, M.D. Gugel:4th International Zinc Coated Sheet Conference; Paris, France; Intergalva Conference Proceedings; June 8, 1994

"Progression of Electrode wear during the RSW of EG Steel," J.A. Wist, C.L. White; SheetMetal Welding ConferenceV; American Welding Society; Detroit, MI; Oct. 7, 1992

"Comparison of Electrode Wear in DSC Electrodes Having Different Hardnesses, "M.D. Gugel ,J.A. Wist, C.L. White; SheetMetal Welding ConferenceV; American Welding Society; Detroit, MI; Oct. 7, 1992

"The Metallugical Aspects of Electrode Wear During the Resistance Spot Welding of Zinc Coated Steels"; J.A. Wist, C.L. White; SheetMetal Welding ConferenceIV; American Welding Society; Detroit, MI; Oct. 10, 1990

Interests

Historic Home Restoration
Active Participant in East Hills Neighborhood Association Initiatives

Gary L. Ovans

15882 Belmont Dr. **(231) 796-6582**
Big Rapids, MI 49307

Professional Objective:

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

Education

Degrees: M.S. Degree: Occupational Education, 1991, Ferris State University
B.S. Degree: Industrial Technology, 1976, UW-Stout
B.S. Degree: Physics and Sociology , 1975, UW Eau Claire

Coursework Taken for Credit:

WEL-489 Topics In Welding, Summer Quarter, 1986
MFG-489 Special Topics In Manufacturing, Summer Qtr., 1987
MFGE-330 Computer Applications for Manufacturing, Summer Qtr., 1992
Quality Technology Certificate:
-MFGE-341 Quality Science Statistics, Spring Qtr., 1993
-MFGE-342 Statistical Process Engineering, Summer Qtr., 1993
-MFGE-442 Design of Experiments, Fall Semester, 1993
-MFGE-443 Continuous Improvement, Winter Semester, 1994

PLTS-290 Plastics and Elastomers, Fall Semester, 1998
CISM-505 Internet As An Instructional Resource, Fall Semester, 2001
MFGE-490 Quality Planning, Winter Semester, 2002
MFGE-444 Quality Auditing, Fall, 2002

Seminars and Workshops Attended:

-Laser based Vision Systems Seminar/Workshop, Michigan State University, 1987
-Methods of Experimentation Workshop (DOE, Taguchi Methodology), FSU, May 1988
-Manufacturing Engineering Faculty Enhancement Workshop, National Science Foundation through U. of Michigan-Dearborn, Summer, 1988
-Application and Implementation of Conveyor Systems Workshop, Society of Manufacturing Engineers, Toronto, Canada, Oct., 1988
-Beginning DOS for IBM PC Workshop, FSU, May, 1989
-Super Abrasives For Educators Seminar, Henry Ford Community College, Oct., 1989
-MAPICS Product Data Management, Lansing Community College, January, 1990
-MAPICS Inventory Management, Lansing CC, February, 1990
-Stata Matrix ISO-9000 Lead Assessor Workshop, Minneapolis, MINN, 1993
-Metrology Seminar, Burton Precision, Grand Rapids, MI, 1995

-Material Handling Teachers Institute, Montana State University, Bozeman, MT, 1995
-Summer Faculty Institute, FSU, Jun. 13, 1996
Awarded **$1,000** for program equipment.
-Statistical Process Control, Frigidaire Corp., Feb., 1997
-Stat-Ease Design of Experiments, Mpls., Minn., Jun. 3-6, 1997
-Measure-Up Metrology Workshop, Madison, WI, Feb., 1999
and Refresher, Feb., 2000, 48 hrs.
-PowerPoint Training, FSU, August 17, 1999
-Geometric Dimensioning and Tolerancing Workshop, Technical Documentation Consultants, Ridgecrest, CA, Jan. 24-28, 2000
-West Point Teaching Methods, FSU, Jan. 3, 2000and Effective Proposal Writing, Feb. 11, 1999
-Computer Numerical Programming Workshop, Purdue University through Parkland College, Champaign, Ill., Jun. 13-16, 2000
-Application of Teaching Methods, FSU, Winter Sem.,2001Awarded **$500** for program equipment
-Trends In Occupational Studies Conference, Nov. 1-2, 2001
-Technical Tooling Seminar, Sandvik Coromant, Feb. 27, 2002
-Ferris Summer University, Jun. 3-6, 2002
-Effective Grading Workshop, FSU, July 24, 2002
-Foundation Blocks For Lean Manufacturing, Society of Manufacturing Engineers, August 18-22, 2003
-Presenter, ASEE Conference for Industry and Education Collaboration, Biloxi, Mississippi, February 3-5
-Developer, Case Files Implementation Institute, Nashville, Tennesee, February 22-26, 2004
-Quick Response Quoting and Manufacturing Certificate Program, Society of Manufacturing Engineers, Dearborn, MI, August 24-26, 2004

Work Experience

August, 1999 to Present

Dept. Chair, Manufacturing Dept. , College of Technology, Ferris State U.

- Perform administrative duties 75 % load as outlined in **Position Description Academic Department Chair,** dated April 12, 2000. Responsible for activities related to operation of department academic programs on the FSU main campus, and as offered at the Applied Technology Center in Grand Rapids, MI. Programs as follows: B.S. Manufacturing Engineering Technology, B.S. Quality Engineering Technology, A.A.S. Manufacturing Tooling Technology, Material Science.
- Teach at 25% load.

September, 1996 to August 1999

Program Coordinator, Manufacturing Program, College of Technology, FSU

- Perform program administrative duties at 50 % load for the Manufacturing Engineering Technology program offerings on the FSU main campus, at the Applied Technology Center in Grand Rapids, and at remote sites as required by the Metal Stamping option of the MET degree.
- Perform administrative duties as required for Quality Engineering Technology B.S. and Material Science offerings.
- Teach coursework at 50% of load.

August 1984 to September, 1996

Academic Faculty, Manufacturing Engineering Technology, COT, FSU

- Teach coursework in the Manufacturing Engineering Technology B.S. program.
    - Main campus, Applied Technology Center, and at remote sites via distance learning.
    - Teach course work to related programs.
    - Teach overloads as necessary.
- Advise students on main campus, Applied Technology Center and at community colleges.
- Serve on program, department, college, and university-wide committees.

Courses Taught:

Manufacturing and Quality* Engineering Technology Core Classes:

- MFG 311 Production Machining Processes
- MFG 312 Production Press-working Processes
- MFG 321 Principles of Process Planning I
- MFG 333 Manufacturing Cost Estimating
- MFG 351 Tool Design for Manufacturing
- MFG 413 Production Welding Processes
- MFG 422 Computer Aided Process Planning
- MFGE 311 Industrial Engineering
- MFGE 321 Metrology*
- MFGE 322 Production Processes
- MFGE 324 Tool Engineering (writing intensive)
- MFGE 326 Process Tolerance design and Analysis
- MFGE 341 Quality Science Statistics*
- MFGE 342 Statistical Process Engineering*
- MFGE 393 Internship (writing intensive)
- MFGE 411 Principles of Process Planning
- MFGE 422 Manufacturing Facilities Planning

- MFGE 499 Capstone Experience

Relateds:

- MFGE 351 Intro to Industrial Engineering
- MFGE 352 Design for Manufacturing
- MFGE 353 Statistical Quality Control
- MFGE 451 Intro to Plant Engineering (Facilities and Automation)

Committee Membership:

- Academic and Administrative Computer Activities Steering Committee, 1987-1988
- Student Activities Budget Advisory Committee, 1988-1989
- Academic Senate, 1990-1992
- College of Technology CIM Taskforce, 1991-1992
- College of Technology Promotion Committee, 1992-1993
- Arts and Lectures Committee, 1995-1997
- Academic Program Review Council (Academic Senate). 1996-1999
- Dept. Curriculum Committee (on-going)
- Faculty Tenure Committees (on-going)
- Academic Program Review for Manufacturing Engineering Technology, 1998, and Quality Engineering Technology, 2001

Seminars and Workshops Conducted:

-Methods Improvement and Analysis, Carlon Meter, Grand Haven MI, 1985
-Noise Level Analysis Project, Morbark Industries, Winn, MI 1985
-Plant Layout and Material Handling Project, Polycore Inc., Crystal MI, 1987
-Gage R & R Evaluation of Prototype Gaging, Cascade Engineering, 1988
-Plant Layout/Material Handling Project, Metal Standard Corp., Holland, MI, 1988
-Automation Feasibility Study, Kysor Corp., Rothbury, MI, 1988
-Plant Layout Documentation and Analysis Project, Grand Haven Stamped Products. Grand Haven, MI 1988
-Manufacturing Engineering Workshop for Costa Rican Industrialists through FSU International, May, 1990
-Motion and Time Study Workshop for Fitzsimmons Manufacturing, Big Rapids, MI, July and August 1990
-Motion and Time Study Workshop, Grand Rapids Controls, August, 1990
-ISO-9000 Executive Overview Seminar through FSU TTC, 1993
-Statistical Process Control Workshop for Fitzsimmons Manufacturing, Big rapids, MI, 1994
-Statistical Process Control Workshop for Lobdell Emory Corporation through Montcalm Community College, 1995
-Industrial Engineering Workshop, The Knoll Group Furniture Division, Grand rapids, MI, 1996
-Engineering Essentials Seminar, SAE, Troy, MI, 1-24-96, 5-13-96, 9-20-96 11-20-96
-Statistical Process Control Basics Workshop, Lobdell-Emory Corp., Alma, MI, 1997

-Quality Engineering Essentials Seminar, SAE Headquarters, Troy, MI, 2-25-97, 8-22-97, 3-20-98, May 98 (Grand Valley State, Eberhardt Center), 9-30-98, & 99
-Process Tolerance Charting and Advanced Product Quality Planning (APQP) Seminar Kellogg-Crank Corp., Jackson, MI, November, 1999
-APQP Workshop, Dura-Automotive Inc., Mancelona, MI, Aug., 2000
-Gage Calibration Practices Workshop through FSU TTC, Soo Plastics, Ste. Sault Marie, MI, Jun. 2001

Industrial Experience:

1976 to 1984

Process Engineer, Production Engineer, Manufacturing Engineer at Chrysler Marine (Hartford, Wis.), FMC Corp. (Port Washington, Wis.), Harley Davison Motor Co. (Milwaukee, WI), Waukesha Bearing Corp. (Antigo, WI).

- Capital equipment justification.
- Manufacturing process design.
- Liaison with outside contractors.
- Plant layout.
- Plant floor trouble-shooting and process improvement.
- Supervision.
- Project Management.
- N/C programming.

Professional Affiliation

Member of the **Society of Manufacturing Engineers** since 1984. Currently hold ranking as a **Senior Member**. Awarded certification as **Certified Manufacturing Engineer** through examination in 1985. Certification maintained through a program of continuous professional development.

Member of **American Society of Engineering Educators**

Waterworks Treatment Plant Operator, Wisconsin certification # 11156

Military Experience

- 4 years active duty in electronic intelligence.
  - Service at remote sites overseas and continental U.S.
- 17 years active reserve duty as combat aircrew, worldwide service on C-130 Hercules aircraft.
  - Search and Rescue
  - Support natural disaster relief efforts
  - Provide joint operational support for Army and Navy special operations units
  - Provide logistical support for embassy operations, drug interdiction, and other activities as required by U.S. foreign policy

Military Experience Continued:

- Schools attended:
  - Electronic Intercept, basic and advanced systems
  - C-130 basic and advanced loadmaster training
  - Water Survival
  - Arctic Survival
  - Basic Survival/POW
  - Field Rigging (parachute)
  - Effective Writing
  - Air Force Management

Activities, Interests, and Hobbies

- Assistant Scoutmaster, Troop 114, Big Rapids, MI
- Boy Scout Merit Badge Counselor
  - Space Exploration
  - Fishing
  - Aviation
  - National Heritage
  - Wildlife
- 4-H Adult Leader in Aerospace and Rocketry
- Fishing, opera and Broadway shows, reading, hunting, gardening, wildlife habitat improvement, scuba diving
- Member in good standing of Chapel of The Lakes Lutheran Church

Attachment 4

MFGT 150 – Manufacturing Process
Credit Hours: 2 (1 Lecture – 3 Lab)

Faculty Loads (FTE)

	1999	2000	2001*	2002*	2003*
**D. Finney	0.33	0.67	0.00	0.33	0.25
**J. Gregory	0.00	0.00	0.00	0.00	0.00
**L. Nemastil	0.00	0.00	0.00	0.00	0.00
**D. Chase	0.14	0.00	0.36	0.39	0.31
**D. Krager	0.17	0.00	0.00	0.00	0.00
***C. Rybeck	0.00	0.39	0.69	0.67	0.75
***R. Goodwin	0.00	0.00	0.00	0.00	0.00
B. Hammond	0.00	0.00	0.00	0.00	0.00
P. Driggers	1.78	0.00	0.00	0.00	0.00
Total FTE	2.42	1.06	1.05	1.39	1.31

*Source: SIS 105, IFS screens.

**MFGT Tenured/Tenure Track Faculty

*** Retired, Adjunct, or Former Faculty

Attachment 4

Manufacturing Tooling Technology
Scheduling Requirements

Course Number	Course Name	Lecture Hours	Laboratory Hours	Contact Hours	Credit Hours	Sections Required	Section Capacity
Major Fall							
Mfgt 111	Removal 1	4	0	4	4	1	40
Mfgt 111	Removal 1	0	12	12	4	1	20
Mfgt 111	Removal 1	0	12	12	4	1	20
Mfgt 112	Handbook	3	0	3	3	1	40
Mfgt 211	Die Construction	4	0	4	4	1	40
Mfgt 211	Die Construction	0	12	12	4	1	20
Mfgt 211	Die Construction	0	12	12	4	1	20
Mfgt 212	CAD/CAM/CNC	3	3	6	4	1	20
Mfgt 212	CAD/CAM/CNC	3	3	6	4	1	20
Major Winter							
Mfgt 121	Removal 2	4	0	4	4	1	40
Mfgt 121	Removal 2	0	12	12	4	1	20
Mfgt 121	Removal 2	0	12	12	4	1	20
Mfgt 122	Manual CNC	3	3	6	4	1	20
Mfgt 122	Manual CNC	3	3	6	4	1	20
Mfgt 221	Mold Construction	4	0	4	4	1	40
Mfgt 221	Mold Construction	0	12	12	4	1	20
Mfgt 221	Mold Construction	0	12	12	4	1	20
Technical Related							
Mfgt 150	Mfg Processes	1	0	1	1	1	30
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150	Mfg Processes	1	0	1	1	1	30
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150	Mfg Processes	1	0	1	1	1	30
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150	Mfg Processes	1	0	1	1	1	30
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150	Mfg Processes	0	3	3	1	1	15
Mfgt 150*	Mfg Processes	1	0	1	1	1	30
Mfgt 150*	Mfg Processes	0	3	3	1	1	15
Mfgt 150*	Mfg Processes	0	3	3	1	1	15
Mfgt 150**	Mfg Processes	1	0	1	1	1	30
Mfgt 150**	Mfg Processes	0	3	3	1	1	15
Mfgt 150**	Mfg Processes	0	3	3	1	1	15
Mfgt 252	Adv. Machine Tools	3	3	6	4	1	20
Mfgt 252	Adv. Machine Tools	3	3	6	4	1	20
TOTALS	**TOTALS**	**43**	**150**	**193**	**93**	**37**	**840**
FTEF/YEAR REQUIRED				**5.36**	**3.88**		
THEORETICAL PRODUCTIVITY SCH/FTEF				**418**			

*** Required for AAS Rubber Technology Winter**
****Required for AAS Rubber Technology Winter**

Attachment 5

Advisory Committee: Names and positions of the Manufacturing Tooling Technology Advisory Board members.

MFGT Advisory Board
September 2, 2004

John MacMillan
Production Manager
ITW Drawform
500 Fairview
Zeeland, MI 49464
Phone: 616 772 1910
Fax: 616 772 9572
E-Mail: johnm@drawform.com
Cell phone:

Dave Sniegowski
Toolroom Manager
Interiors
Johnson Control
Automotive Systems Group
921 E. 32nd St.
Holland, MI 49423
Phone: 616 394 6437
Fax: 616 394 6464
E-Mail: david.sniegowski@jci.com
Cell phone:

Art Hedrick
Die Ology
6579 River Oak Circle
Greenville, MI 48838
Phone: 616 225 2170
Fax:
E-Mail: dieology@pathwaynet.com
Cell phone: 616 485 2403

Geoff O'Brien
President
Proper Mold & Engineering, Inc.
13870 E. 11 Mile Road
Warren, MI 48089
Phone: 586 779 8787 Ext. 107

Brandon Wenzlik
Associate Supervisor
Design Engineering
PME Companies
PO Box 3007
Centerline, MI 48015
Phone: 810 779 8787
Fax: 810 779 4530
E-Mail: bwenzlik@pmecompanies.com
Cell phone:

Jim Fabris
Chief Executive Officer
Hurco North America
Hurco Companies Inc.
One Technology Way
Indianapolis, IN 46268
Phone: 800 624 2416

Joseph Tarajos
Supervisor, Metalworking & Thermal Processes
Materials Engineer
DaimlerChrysler Corporation
800 Chrysler Drive East
CIMS 482-00-15
Auburn Hills, MI 48326-2757
Phone: 810 576 7384
Fax: 248 576 7490
E-Mail: jmt24@daimlerchrysler.com

Steve Braykovich
Axsys
29627 West Tech Drive
Wixom, MI 48393
Phone: 248 926 8810
Fax: 248 926 9085
E-Mail: steveb@axsysinc.com

Joseph Tarajos Jr.
Phone:
Fax:
E-Mail: jtarjos@comcast.net
Cell phone:

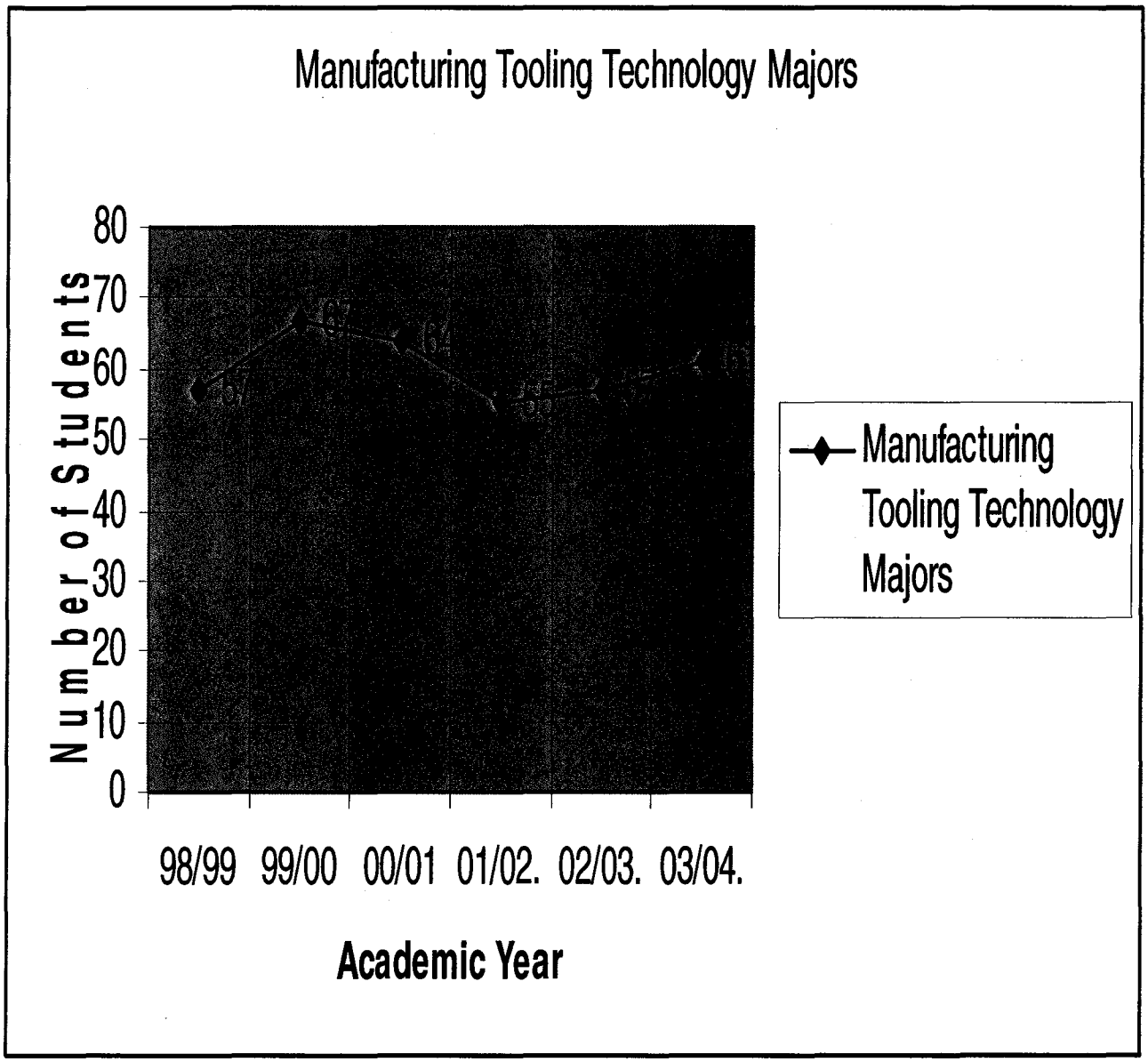
Appendix B

Attachment 1: Student Enrollment Chart

Attachment 2: Enrollment Graduate Comparison Chart

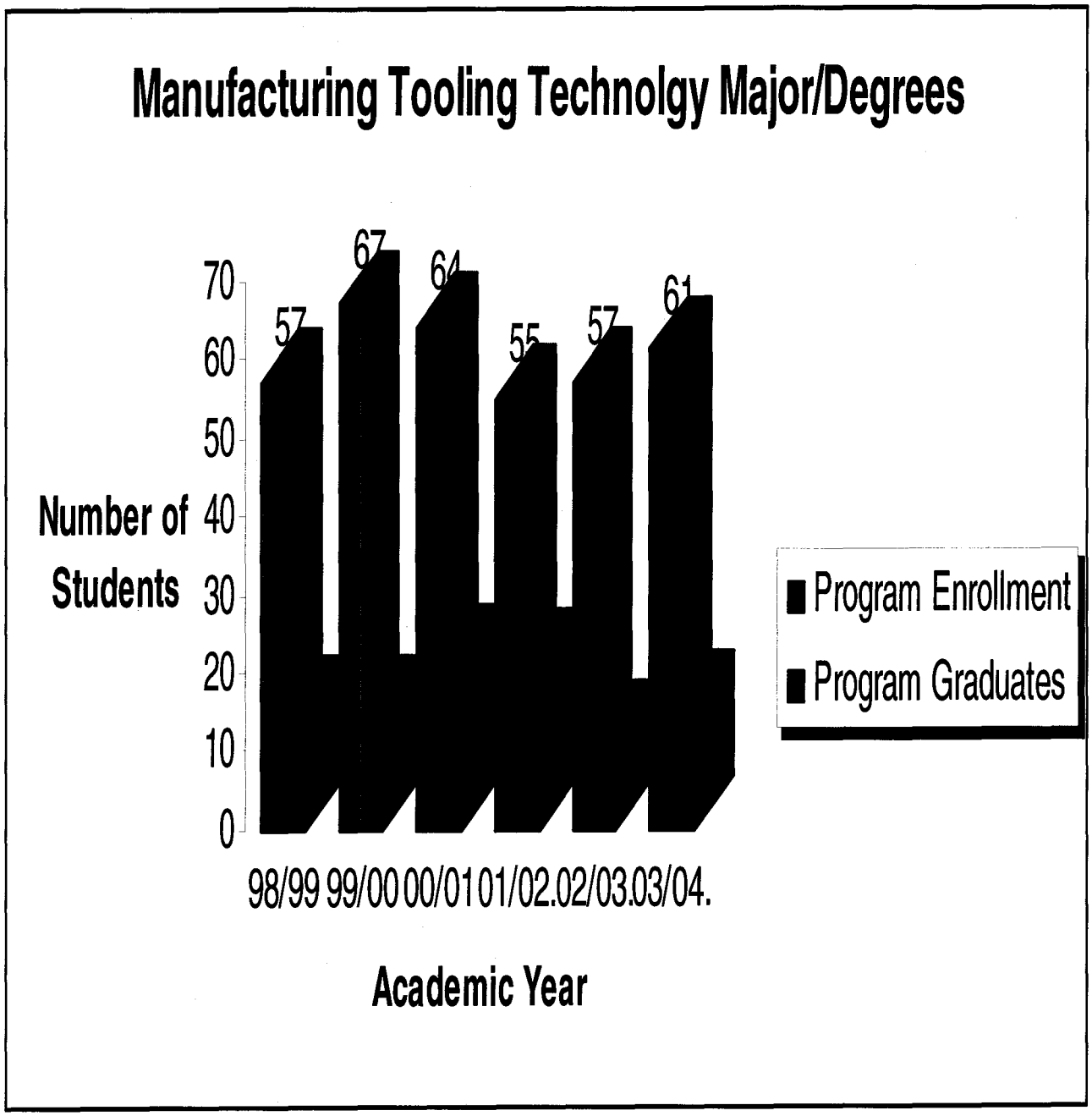
Attachment 3: QUOTTECMFT Screen Print

Attachment 1



Source: Ferris State University Fact Book

Attachment 2



Source: Ferris State University Fact Book

Attachment 3

107 Class List ,TEC QUOTA CONTROL-MANUF TOOL TEC
,ADMISSIONS USE ,
Screen:,___, SID:,10342434 , Course:,QUOTTECMFT , Term:,04F,,Fall Semester 2004
Page, 1

Line	Student Name	Student ID	Col	Cls	Maj	Registration Status
1,	BARKALOW, SCOTT H	101-98-694	,	TEC,FR	MFGT,	Enrolled
2,	BEKKEN, KENTON J	102-19-452	,	TEC,FR	MFGT,	Enrolled
3,	BOSWORTH, MATT E	100-87-901	,	TEC,FR	MFGT,	Enrolled
4,	COLEY, AMANDA JOY	103-39-971	,	TEC,FR	MFGT,	Enrolled
5,	DICK, STEVEN W	103-30-931	,	TEC,FR	MFGT,	Enrolled
6,	FOSTER, JASON E.	102-94-450	,	TEC,FR	MFGT,	Enrolled
7,	FRIZZLE, BRANDON L	103-48-046	,	TEC,FR	MFGT,	Enrolled
8,	GRAVELINE, DUSTAN N	103-40-028	,	TEC,FR	MFGT,	Enrolled
9,	GUZZI, LINDSEY NICHOLE	102-71-588	,	TEC,FR	MFGT,	Enrolled
10,	HARRISON, ANDREW CHUN-	100-93-319	,	TEC,FR	MFGT,	Enrolled
11,	HUBERS, KYLE JEFFERY	103-44-011	,	TEC,FR	MFGT,	Enrolled
12,	KELLY, SEAN MICHAEL	103-22-730	,	TEC,FR	MFGT,	Enrolled
13,	KORRECKT, JARED LEE	100-89-081	,	TEC,FR	MFGT,	Enrolled
14,	KUPTZ, KENNETH P	103-04-349	,	TEC,JR	MFGT,	Enrolled
15,	LAPOINTE, DAVID CHARLE	100-88-054	,	TEC,FR	MFGT,	Enrolled
16,	LATTA, CHESTER ARTHUR	103-43-133	,	TEC,FR	MFGT,	Enrolled
17,	LIJEWSKI, JOSHUA D	103-35-173	,	TEC,FR	MFGT,	Enrolled
18,	MADDOX, DA'ANDRAE	103-52-249	,	TEC,FR	MFGT,	Enrolled
19,	MARKUS, MATTHEW JOHN	103-24-607	,	TEC,FR	MFGT,	Enrolled
20,	MORAN, JONATHAN PHILLI	103-40-499	,	TEC,FR	MFGT,	Enrolled
21,	NEAR, DAVID J	101-29-861	,	TEC,FR	MFGT,	Enrolled
22,	NIXON, BRADLEY S	101-99-897	,	TEC,JR	MFGT,	Enrolled
23,	PETERSEN, JOSEPH STEVE	103-44-394	,	TEC,FR	MFGT,	Enrolled
24,	SCHAUT, GARY D	103-27-542	,	TEC,FR	MFGT,	Enrolled
25,	SEARCY, CHANCELLOR DEM	103-62-952	,	TEC,FR	MFGT,	Enrolled
26,	SMITH, DANIEL K	100-61-156	,	TEC,FR	MFGT,	Enrolled
27,	SMITH, JACOB PETER, SR	103-60-829	,	TEC,FR	MFGT,	Enrolled
28,	WALLACE, JEREMY E J	103-65-144	,	TEC,FR	MFGT,	Enrolled
29,	WEAVER, JOHN MICHAEL	103-41-231	,	TEC,FR	MFGT,	Enrolled
30,	WILSON, JACQUELINE	100-80-167	,	BUS,FR	VISD,	Enrolled
31,	WISELY, ROBERT J	102-69-440	,	TEC,JR	MFGT,	Enrolled
32,	WRIGHT, ROBERT DAVID	103-56-862	,	TEC,FR	MFGT,	Enrolled

Appendix C

Attachment 1: A List of Donations

Attachment 2: Faculty Committee Participation

Attachment 1

DonorName	RecDt	Description	Amount	Units	TotalValue	GiftForm
Sandvik Coromant	7/6/2000	See Attached			$ 880.00	12074
GK Punch	8/28/2000	48 punch blanks			$ 553.92	13141
Sandvik Coromant	10/11/2000	See Attached			$ 2,180.00	13144
Quinco Tool Products	10/10/2000	See Attached			$ 1,200.00	13148
GK Punch	11/16/2000	See Attached			$ 202.80	13149
Simonds Industries	11/7/2000	See Attached			$ 200.00	13156
A. Finkl & Sons	1/16/2001	See Attached			$ 2,450.00	13298
Vantico, Inc.	1/29/2001	See Attached			$ 2,095.11	13299
Vantico, Inc.	3/29/2001	See Attached			$967.42	13360

Attachment 1

Donor Name	Date	Description	Amount	Details	Total Value	Gift Form #
GKN Automotive	8/29/2001	obsolete equip.			$ -	none - letter only
Quinco	9/10/2001	end mills			$ 1,450.00	13386
Sandvik Coromant	10/5/2001	supplies and tools			$ 2,790.60	13745
GK Punch and Die	10/26/2001	punches and blanks			$ 254.84	13746
Doug Chase Sr.	11/13/2001	taps			$ 318.15	13791
Kamp Oil	11/8/2001	coolant			$ 674.37	13792
Newall Digital Readouts	12/21/2001	Lathe Readout			$ 2,600.00	13797
Springwood Industrial	12/21/2001	Lathe and Mill			$ 18,800.00	13798
Kamp Oil	2/6/2002	Citgo products			$ 88.55	13873
Simonds	3/26/2002	files			$ -	none - letter only
GK Punch and Die	3/14/2002	punch blanks			$ 27,925.84	13913
Kamp Oil	4/22/2002	Citgo products			$ 876.15	13915

Attachment 1

Donor Name	Date Received	Description			Total Value	Gift Serial
Quinco Tool Products	8/29/2002	Factory seconds			$ 1,200.00	014147
Progressive Components	12/3/2002	Mold bases for plastic injection			$ 10,057.92	014584
Sandvic Coromant	1/9/2003	Carbides and fasteners			$ 3,554.00	014588
Hurco Companies	1/24/2003	Discount on equip. purchase			$ 27,243.00	014831
~~Hurco Companies~~	~~1/24/2003~~	~~Consignment of Machining Center – VOID~~	-	-	$48005.00	~~014832~~
~~Hurco Companies~~	~~1/24/2003~~	~~Consignment of Winmax Software – VOID~~	-	-	$189200.00	~~014833~~
Quinco Tool Products	2/18/2003	End mills			$ 4,731.85	014835
Vantico	3/6/2003	Epoxy			$ 813.04	014876
Fullerton Tool	4/23/2003	Carbide tooling			$ 2,599.97	014877
Hurco Companies	1/24/2003	Consignment of Machining Center			$ 6,865.00	014892
Hurco Companies	1/24/2003	Consignment of Winmax Software			$ 37,840.00	014893
Doug Chase Sr.	5/6/2003	Taps and drills			$ 322.42	014894

Attachment 1

Donor Name	Date	Description	Amount	Date	Amount	Fund #
Quinco Tool	9/2/2003	Misc. end mills			$ 8,434.24	014987
Sandvik Coromant	5/28/2003	Carbides			$ 4,757.00	014988
Johnson Controls	9/30/2003	Misc. tools and plastic			$ 4,000.00	014994
GK Punch & Die	10/27/2003	Punches			$ 436.00	015184
Corporate & Professional Development Center	11/5/2003	Misc. Supplies & Equip	-	-	$ 2,465.00	NONE REQUIRED
Bill Liddell	11/10/2003	Tool boxes and tools	-	-	$ 2,229.61	015185
GK Punch & Die	11/12/2003	Punches			$ 112.32	015190
DaimlerChrysler	11/25/2003	Steel bars			$ 1,927.50	015193
Hurco Companies	1/24/2002	Consignment			$ 6,865.00	015405 - Dean's Office
Suburban Tool	4/19/2004	Discount on purchase			$ 1,294.00	015335
Fullerton Tool Company	4/20/2004	Carbide drills and end mills			$ 8,200.00	015336

Attachment 2

Dennis Finney

Committee Participation
(department/college/university)

Committee Participation

1996-97 College of Technology Promotion Committee. (Sec E page 47)

1998 Served on the Dean Search for the College of Technology which worked Christmas Vacation to hire Dr. Waldheim. (Sec E page 48)

1997 – 2004 Served on Newaygo County Machine Trades advisory committee. (Sec E page 49)

1994 to 2002 Served on Department Curriculum Committee

Department Responsibilities

1995- 2004 Recruited in 12 high schools and skill centers each year.
Participate in Autumn Adventure (Sec E page 51, 57-58)

1995-04 Each year I arrange everything for a pizza party for Transmatic MFG. Co

1995-99 Coordinate the letters of application and letters from faculty for a scholarship.

2/10/97 Met at Wexford Missaukee Area Career Center to determine how Ferris could interface with 8 different schools.

1994-98 Department Curriculum Committee.

Involvement In Student Activities

May 5th 1998 The MFGT program invited voc machine tool instructors from around the state to come to Ferris to discuss how we can work together.

1994 to 2001 – Continue to be a volunteer for (SME) Society of Manufacturing Engineers Technical Referral Database in the area of SLA stereolithography 3D Systems, powder metal parts from SLA models. (Section F page 1-2)

Attachment 2

Jack Gregory

Committee Participation (department/college/university)

College of Technology Promotion Committee Member (2 year term)

College of Technology Curriculum Committee Member (1999-2003)

Computer Users Group Committee

Advisor to the Ferris State Tooling Technologist Association

College of Technology Scholarship Review Committee (2002 & 2003)

Attachment 2

Doug Chase

Committee Participation (department/college/university)

Attachment 2

Louis Nemastil

Committee Participation (department/college/university)

Departmental / Search Committee
1999 - Served on the search committee for a tenure track position for the Manufacturing
Tooling Technology Program. Reviewed all of the applications and five candidates were selected to be interviewed. Participated in the interview process with fellow faculty members Dennis Finney and Jack Gregory and program coordinator Ken Kuk. July 26, 1999 through July 28, 1999. *(20 Hour Process)*

Departmental / Mentoring Appointment
1999- Program coordinator Ken Kuk asked me to be the mentor for Dean Krager. Dean joined the Manufacturing Tooling Technology faculty in August 1999; I will be mentoring Dean throughout the 1999 / 2000 school year. *(1 Year Appointment)*

Departmental / Curriculum Committee
2000- Accepted the position to serve on the Manufacturing Department curriculum committee for the 2000/2001 academic year. Review of the current curriculums being used in all manufacturing lectures and labs, is one of the key focuses of the committee.
(1 Year Appointment) *(Served 4 Consecutive years)*

College / Associate Dean Search Committee
2000-Volunteered to participate on the search committee for the Associate Deans position for the College of Technology, Ferris State University. March 16, 2000.
(Time of Term Unknown)

University /Conduct Review Committee
2000-Present Volunteered on October 20, 2000 to be a participant on the Conduct Review Committee. Dr. Chapman has been asked to appoint 5 faculty members to be members of the Conduct Review Committee (CRC) in Judicial Services. The official notice of acceptance of serving on the committee was directed to Roberta Hoisington located in the (COT) Deans office.
(1 Year Appointment) *(Served 4 Consecutive years)*

Departmental / Program Review Committee
2003/2004-Participated in the Manufacturing Tooling Technology Program Review. Served on The Manufacturing Tooling Technology Review Panel during the 2003/2004 academic school year. I served as a co-leader with assistant professor Dean Krager. Volunteered to be the Secretary/Typist of the report. A copy of the report is located in the Manufacturing Department Office. *(60 Hour Process)*

Attachment 2

Dean Krager

Committee Participation (department/college/university)

Department Curriculum Committee (since 1999)

College of Technology Scholarship Review Committee (2003 & 2004)

Advisor to the Ferris State Tooling technologist Association

Appendix D

Attachment 1: Curriculum Check Sheet

Attachment 2: Course Sequence Check Sheet

Attachment 3: Unit Action Plan

Attachment 1

Curriculum Check Sheet

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

MANUFACTURING TOOLING TECHNOLOGY
ASSOCIATE IN APPLIED SCIENCE DEGREE
FALL SEMESTER
Curriculum Guide Sheet

NAME OF STUDENT: _____ STUDENT I.D.: _____

Total semester hours required for graduation: 68

NOTE: Meeting the requirements for graduation indicated on this sheet is the responsibility of the student. The student is also responsible for meeting all FSU General Education requirements as outlined in the university catalog. Your advisor is available to assist you.

			CREDITS	COMMENTS/GRADE
FIRST YEAR-FALL SEMESTER				
MFGT	111	Metal Removal 1	8	
MFGT	112	Machinery Handbook Calculations (MFGT 111 co-req)	3	
CDTD	150	Blue Print Reading and Analysis	2	
ENGL	150	English 1	3	
FIRST YEAR-WINTER SEMESTER				
MFGT	121	Metal Removal 2 (MFGT 111)	8	
MFGT	122	CNC Manual Part Programming (MFGT 111)	4	
MATH	116	Interm. Algebra & Numerical Trigonometry (MATH 110)	4	
SECOND YEAR-FALL SEMESTER				
MFGT	211	Metal Forming Die Construction (MFGT 121)	8	
MFGT	212	CAD & CAM for CNC Machinery (MFGT 122)	4	
MATL	240	Introduction to Material Science	4	
____	___	Scientific Understanding w/lab Elective	3	
SECOND YEAR-WINTER SEMESTER				
MFGT	221	Plastic Mold Construction (MFGT 121)	8	
____	___	Social Awareness Elective	3	
____	___	Cultural Enrichment Elective	3	
ENGL	250	English 2	3	
	OR			
ENGL	211	Industrial and Career Writing	3	

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

CURRICULUM REQUIREMENTS
MANUFACTURING TOOLING TECHNOLOGY
ASSOCIATE IN APPLIED SCIENCE DEGREE
FALL SEMESTER

TECHNICAL		HOURS	CREDIT HOURS
MFGT	111	Metal Removal 1	8
MFGT	112	Machinery Handbook Calculations	3
MFGT	121	Metal Removal 2	8
MFGT	122	CNC Manual Part Programming	4
MFGT	211	Metal Forming Die Construction	8
MFGT	212	CAD & CAM for CNC Machinery	4
MFGT	221	Plastic Mold Construction	8
Technical Related			
CDTD	150	Blue Print Reading and Analysis	2
MATL	240	Introduction to Material Science	4

GENERAL EDUCATION			CREDIT HOURS
Communication Competence			
ENGL	150	English 1	3
ENGL	250	English 2	3
	OR		
ENGL	211	Industrial & Career Writing	3
Scientific Understanding			
Elective			3
Quantitative Skills			
MATH	116	Interm. Algebra & Num. Trig.	4
Cultural Enrichment			
Elective			3
Social Awareness			
Elective			3

A.A.S. Degree Minimum General Educational Requirements in Semester Hours:

Cultural Enrichment Credits - 3
Communication Credits - 6
Social Awareness Credits - 3
Scientific Understanding Credits - 3/4

5/01 4
pm\cksh08f\mfgt

(OVER)

Attachment 2

Course Sequence Check Sheet

FERRIS STATE UNIVERSITY

Associate in Applied Science in

Manufacturing Tooling Technology

Technical Sequence

MFGT 111 Metal Removal 1
For beginning machine tool students. Shop safety, measuring instruments, layout and bench work. Drilling machines, tool room lathes, vertical/horizontal milling machines, introduction to CNC machining and floor grinders. 8 credits.

MFGT 112 Machinery Handbook Calculations
The use of the MachineryÁs Handbook calculations. Tables, charts, and formulas are applied to the needs of the toolmaker such as: ratios, proportions, tapers, levers, screws, pulleys, gear trains, allowances, tolerances, fits, hole circles, and segments. Set up and checking procedures used by the toolmaker. Emphasis on algebra, applied geometric principles, and right angle trigonometric functions. Corequisite: MFGT 111. 3 credits.

CDTD 150 Blueprint Reading and Analysis
For first year manufacturing tooling students. Print layout of information, tolerance block, revision block, do not scale block, notes, bill of material and product detail layout; sketch drawings of simple details from selected shop drawings to include dimensioning, tolerancing, and notes as related to the understanding of reading a part, detail, tool, mold, or die blueprint. Projection, sectioning, and alternative dimensioning; emphasis on shop floor communication. 2 credits.

MFGT 121 Metal Removal 2
For second semester manufacturing tooling students. More advanced machining operations on the lathe and mill along with basic surface grinding. Thread and taper terminology, measurement, and methods of machining are new topics along with boring, broaching, indexing, rotary table milling, tool post grinding, applying cutting tool materials such as ceramic, cermets, carbide tooling and coolants/lubricants. Prerequisite: MFGT 111. 8 credits.

MFGT 122 CNC Manual Part Programming
Manual programming for numerical controlled machinery. Types of CNC controls, machinery, formats, and basic terminology studies. Set-up, tooling, fixturing, and basic program storage methods. Simple part programming includes milling, 3-D contour, and turning. A basic CAD/CAM demo will also be discussed. 4 credits.

MFGT 211 Metal Forming Die Construction
Metal forming die making; use of mill duplicating, CNC electrical discharge machining, tool tryout and rework, and CNC milling. Laboratory projects specialize in metal forming. Diemaking stamping presses, die automation, and electrical sensors; heat treating, whirl-i-gig grinding, surface grinding, and hand grinding. Prerequisite: MFGT 121. 8 credits.

MFGT 212 CAD/CAM for CNC Machinery
Fundamentals of programming tool motion on complex surfaces that are created on a 3-D (CAD) based system. Create simple 2-D and 3-D drawings, drive tool motion over the 3-D surface, post process the tool data, and edit the output files before sending the program to a machine tool for machining. The basic CMM principles used to measure points on a complex surface for the creation of verification of a surface. Prerequisite: MFGT 122. 4 credits.

MATL 240 Introduction to Material Science
Engineering materials: metals, polymers, and ceramics: atomic structure and bonding, properties selection, and testing of materials, failure modes, methods of production and fabrication, methods of changing properties including heat treatment of metals, alloying and surface treatments, mechanical working, composites and compound bonding. Common classification systems used to identify the various engineering materials. 4 credits.

MFGT 221 Plastic Mold Construction
Continuation of previous machine tool training in which mold making, mill duplicating, and pantographing, CNC electrical discharge machining, mold polishing, and the mold try-out machining. Prerequisite: MFGT 121. 8 credits.

Attachment 3

Manufacturing Tooling Technology Unit Action Plans

Priority #1

Concise Description of Plan
To create and utilize a technically equipped classroom / staging area located adjacent to the MFGT lab facilities, which will provide the program a "quiet" area for the display, demonstration, and discussion of required course procedures and related tooling. This plan includes expenditures totaling approximately $36,000. A detailed plan is available upon request.

What value does this plan add to the University?
Offers an exceptional location for related workshops and seminars such as those being offered annually by the Michigan Department of Career Development's "Michigan Manufacturing Technology.

How does this plan support the Strategic Plan of the University?
Supports FSU's Strategic Plan Issue #5, Objectives #1,#2, & #5.

Priority #2

Concise Description of Plan
To promote and enhance growth through attracting students with higher academic achievement, while maintaining an appropriate program mix and to continue as a leader in career oriented and technical education, the Manufacturing Tooling Technology laboratory equipment needs to be dynamically enhanced. This plan involves the purchase of more CNC machining centers and other support equipment. With the continuous change and improvement in technology, enhancement of this equipment must be a priority.

What value does this plan add to the University?
Potential to attract and retain a better-prepared student. Manufacturing Tooling Technology laboratories serve and support many programs within the College of Technology including: Manufacturing Tooling

How does this plan support the Strategic Plan of the University?
Supports FSU's Strategic Plan Issue #5, Objectives #1,#2, & #5.

Attachment 3

Priority #3

Concise Description of Plan
To increase student enrollment and retention through additional faculty contact with potential students and student mentoring activities. This involves the personal development and nurturing of relationships with secondary and technical schools, increased phone contact, and annual reproduction and distribution of the MFGT program video. This plan includes annual expenditures totaling approximately $2,500.

What value does this plan add to the University?
1.) Increases enrollment by providing early program exposure to potential students.
2.) Improves retention by involving current students in mentoring activities with incoming students.

How does this plan support the Strategic Plan of the University?
Supports FSU's Strategic Plan Issue #1, Objectives #1 & #4.

Priority #4

Concise Description of Plan
To personally develop and nurture industrial partnerships with related industry so as to acquire needed equipment and tooling. This plan includes annual telephone support, faculty travel, and equipment transportation costs totaling approximately $6,000.

What value does this plan add to the University?
Provides the MFGT program a means of updating and improving its equipment and facilities.

How does this plan support the Strategic Plan of the University? Supports FSU's Strategic Plan Issue #3, Objectives #2, #4, & #5 and Issue #5, Objective #3.

Priority #5

Concise Description of Plan
To obtain and utilize multi-media presentation equipment for the purpose of integrating current and future multi-media based instructional materials. This plan includes the purchase of laptop computers, required software and projector systems. A detailed plan, including hardware and software requirements, is available promptly upon request.

What value does this plan add to the University?
Allows program faculty to utilize their previously developed world-class instructional materials.
2.) Provides critical support for off-campus instruction and presentations related to the MFGT program.

How does this plan support the Strategic Plan of the University?
Supports FSU's Strategic Plan Issue #4, Objectives #4, & #7.

Attachment 3

Priority #6

Concise Description of Plan
To update the MFGT faculty's technical knowledge. This plan includes annual expenditures totaling approximately $5,000 ($1,000 per faculty).

What value does this plan add to the University?
Broaden and / or deepen the current faculty knowledge base in order to further develop world-class instructional materials and related programming.

How does this plan support the Strategic Plan of the University?
Supports FSU's Strategic Plan Issue #2, Objectives #1, #3, #4, #5, #6, #7, #8, #9.

Manufacturing Engineering Technology

APRC 2004-2005

Extra page: 1

ADMINISTRATIVE PROGRAM REVIEW 2003

Program/Department: Pre-Manufacturing Engineering Technology/
Manufacturing Engineering Technology

Purposes of Administrative Program Review:

1. to make deans and department heads/chairs aware of important quantitative and qualitative information about the programs in their colleges
2. to make the Vice President for Academic Affairs' Office aware of important quantitative and qualitative programmatic information from across the University
3. to document annual information that will be useful in the University's accreditation efforts
4. to provide information for the Academic Program Review Council to use in its deliberations

Please provide the following information:

Enrollment

	Fall 1999	Fall 2000	Fall 2001	Fall 2002	Fall 2003
Tenure Track FTE	5 (3)	5 (1) (2) 4)	5 (1)	5 (1)	5 (1)
Overload/Supplemental FTEF	.87	.43	.58	.50	.83
Adjunct/Clinical FTEF (unpaid)	N/A	N/A	N/A	N/A	N/A
Enrollment on-campus total*	46	50	45	35	29
Freshman	0/0	0/0	N/A	N/A	N/A
Sophomore	0/1	0/1	N/A	N/A	2
Junior	0/17	2/13	8	1/8	1/6
Senior	3/28	1/36	37	2/27	3/21
Masters	N/A	N/A	N/A	N/A	N/A
Doctoral	N/A	N/A	N/A	N/A	N?A
Pre-Professional Students	3	3	3	3	
Enrollment off-campus*	55	57	75	81	62
Traverse City	N/A	N/A	N/A	N/A	N/A
Grand Rapids	55	57	75	81	62
Southwest	N/A	N/A	N/A	N/A	N/A
Southeast	N/A	N/A	N/A	N/A	N/A

31

59

*Use official count (7-day)

(1) One of the faculty is on .75 release time as Dept. Chair.
(2) One faculty is on sabbatical for the Fall 2000 semester
(3) One faculty is on .50 release time as Program Coordinator
(4) Fifth faculty member in place winter semester

Pre MFGE/MFGE B.S.

If there has been a change in enrollment, explain why:

Enrollment decline – increase in on-campus and off-campus competition for same pool of students.

Capacity:

Estimate program capacity considering current number of faculty, laboratory capacity, current equipment, and current levels of S&E.

____50_____students (25 juniors, 25 seniors)