MEMORANDUM

DATE: November 19, 2003

TO: Academic Senate

FROM: Academic Program Review Council

RE: Recommendations for:

Associate of Applied Science Degree in CAD Drafting Tool Design Technology

CC: Rick Eldridge, Randy Stein, Charles Metrosic, Laurie Chesley, Thomas Oldfield,

RECOMMENDATION OF ACADEMIC PROGRAM REVIEW COUNCIL:

We recommend that this program be continued.

DESCRIPTION OF PROGRAM:

CATALOG DESCRIPTION:

Why Choose CAD Drafting and Tool Design Technology?

The CAD Drafting and Tool Design program concentrates on the use of CAD in product drawing, dies (metal stamping), molds (plastic processes) and jig, fixture and gauge design. Students are involved with computers throughout the program to familiarize them with CAD software and applications such as detailing, GD & T, general tolerancing, wire frame, surfacing, solid modeling with parametric technology and Rapid Prototyping. Computer-aided engineering software for mold design and mechanical applications are also used. Student solid models are processed and created on our Rapid Prototyping equipment.

Tool design is critical to the manufacturing industry. Tooling is the foundation for product design and the manufacturing industry. Students learn to design and detail basic tooling requirements for the manufacture of products. Consideration for safety of the design and manufacturing processes are also emphasized. Students also gain an understanding of the related areas of mathematics, materials and machining.

Prepare for a Great Career

Converting an abstract idea into a working design is the job of the drafter and tool designer. The drafter/designer may be involved in drawing one of many parts of a complete assembly, then designing the tooling-jigs, fixtures, gauges, dies, injection molds and special machines-to produce one or all of those parts.

For the drafter/tool designer, creativity and attention to detail are essential in production of such diverse products as automotive and aircraft components, consumer products, medical products, electronics, food processing and special machinery.

Graduates of the program find immediate employment as computer-aided tool detailers, product drafters, entry-level tool designers, CAD operators and other technical-related positions. Many students choose to continue into B.S. programs such as Product Design Engineering Technology, Manufacturing Engineering Technology, Plastics Engineering Technology, Business Management or Occupational (Teacher) Education.

Admission Requirements

Admission to the College of Technology is open to high school graduates who demonstrate academic preparedness, maturity and seriousness of purpose with backgrounds appropriate to their chosen program of studies. Among first-time students in our technical programs, the average high school GPA is 2.8, and the average ACT composite score is 20.

Students entering the CAD Drafting and Tool Design Technology program should have a background in CAD and a desire to develop tool design skills. Admission is open to high school graduates with a minimum 2.0 GPA and a minimum ACT math subscore of 15 (19 recommended).

Graduation Requirements

The CAD Drafting and Tool Design Technology program at Ferris leads to an associate in applied 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 in the General Education section of the University Catalog.

BACKGROUND INFORMATION OBTAINED FROM THE REVIEW PROCESS:

This program is housed in the Mechanical Design Department of the College of Technology. This department is composed of 16 faculty, 6 programs (4 Bachelor and 2 Associate) and serves 251 students (approx 10% of the COT) not including off campus programs.

Graduates of the CAD Drafting Tool Design Technology program are able to seek gainful, career positions in industry after completion of this 2 year program. Many graduates are able to ladder into the Product Design, Manufacturing Engineering, Career Technical Education, Mechanical Engineering Technology and Plastic Bachelors Degrees.

Enrollment has been stable. According to the Administrative Program Review, enrollment has increased slightly from 69 in the fall of 1998 to 74 in the fall of 2002. The program can accept 44 freshman (the targeted enrollment is 80 but 78 is a more realistic capacity). Last year the program had 65 prospects and enrolled 44. This fall there are 48 freshman and 31 sophomores in the program.

Graduate surveys were returned from 121 grads. The exact comments were reported.

Employer survey was mailed to 220 employers. Seventy were returned for insufficient address. Of the 150 mailings that reached employers, 52 were returned (34.7% return rate). The exact comments were reported.

There were 55 responses to the student evaluation form. The exact comments were reported.

Advisory surveys were sent out to 11 board members and 5 were returned. The exact comments were reported.

COST INFORMATION:

According to the 2000-2001 report from institutional research:

Total cost per SCH

AAS Degree in CAD Drafting and Tool Design	$261.68

Total program cost

AAS Degree in CAD Drafting and Tool Design	$17,532.69

ASSESSMENT OF THE CAD DRAFTING TOOL DESIGN TECHNOLOGY PROGRAM

(1) The program has a number of important strengths:

- The program provides hands-on, laboratory based career education and training incorporating current technology. This program is directly related to the mission of Ferris State University.
- This is the only 2-year program in Michigan with such a strong emphasis on tool design.
  - Programs in computer aided design are offered by private schools like Baker and ITT.
  - Programs are offered at several community colleges but do not include Injection Mold Design and Metal Die Stamping, nor do the credits equal those in this program.
- Graduates for this program consistently pursue more advanced degrees.
  - Approximately 60% - 75% continue their education at FSU in the BS Engineering Technology programs.
- The quality of the program can be demonstrated by the quality and quantity of job placement. There is 100% placement of students seeking employment.
- The survey data suggests that the average starting salary for a graduate of this program is $27,000.
- There is the constant pursuit by the faculty for additional degrees and attendance at workshops, seminars and conferences.
- The faculty uses WebCT and digital presentations in instruction.

- The program has received industrial support over the years.
  - Industry donations have helped in developing the new advanced tool design lab and the RP Center.
  - The program has received support for tours of various companies in order to see design and manufacturing operations.
  - It has received donated parts and products.
  - During the last five years, the program has received in excess of $108,000 dollars for equipment.
- The program faculty offer CAD summer camps, has developed posters with tear off cards that are placed in the classrooms in schools, and schedules tours of the facilities and visits to high schools.
- Faculty have attended the National Technical Preparation Conference and State of Michigan Governors conference last three years.
  - With the program presenting at state and national conferences the program has also gained a national exposure and reputation.
- With tool design being the foundation for all manufacturing process, graduates with tool design skills are highly sought after.
  - This program is a provider of CAD/draftsman for Product, Tool, Die, Gage, and Injection Mold designer to the State of Michigan as well as the Great Lakes region.
- In this program there are 3 Tenured faculty with MS degrees, 1 Tenured track faculty on his tenure year with a BS degree and approaching his MS degree and 1 Internationally Certified faculty in Geometric Dimensioning and Tolerancing.
- During the last five years:
  - Three of the four faculty have received a promotion or merit award..
  - All of the four faculty have attended a regional or national professional meeting.
  - Three of the four faculty have had a paper published and/or given a presentation/poster session at a professional meeting.
- The Interim Dean of the College of Technology voiced strong support of this program during the meeting with the Council.

(2) The Academic Program Review Council has the following concerns:

- Computers are the raw materials of this program. Current and high level computers are required to run the sophisticated software required for computer aided design activities. Thus computers must be replaced frequently with upgraded models.
- The program faculty perceive the need for additional support staff.
- The faculty in this program believe that bureaucracy and policies related to web site development program is excessively restrictive and hinders their marketing efforts.

- The program developed its own survey form and data from surveys are not as complete as it could be:
    - Of surveys sent to employers, 70 were returned for insufficient address and 52 of 150 (34%) were returned.

(3) The Academic Program Review Council recommends that the following steps need to be taken to maintain the quality of this program:

- The University and the College of Technology should develop a plan to insure that there is an adequate rotation (on a regular basis) of new computers into the computer labs that will support the rapidly changing and increasingly sophisticated software that is required by this program.
- The University and the College of Technology should support the efforts of the faculty in this department toward recruiting new students including web site development, database creation, and the offering of academic summer camps.
- The College of Technology should review and evaluate the adequacy of the support staff for this and other programs in the college.

Questions for Associate of Applied Science Degree in CAD Drafting Tool Design Technology Panel

The bulleted items found under item 5 pages 15-16 of the document Academic Program Review: A Guide for Participants are the primary basis of the evaluation of the Associate of Applied Science Degree in CAD Drafting Tool Design Technology Program. The following questions are directly related to these criteria. The bullet number to which the question refers is cited prior to the question.

5 **Please list the primary skills, abilities, and knowledge base that you expect that a graduate of your program would possess.**

The first year of the CAD Drafting Tool Design program requires the students to know and apply the following knowledge.

- Projection and visualization and drafting skills.
- Drawing standards based on ASME Y14.5M 1994.

Drawing and Dimensioning Standards. Geometric Dimensioning and tolerancing standards and applications.

- Manufacturing processes and applications are also explored.

Students will be able to construct three dimensional solid models and be able to create proper engineering documentation of the component for production.

In the CDTD 122 course students learn how to create a solid model and how to develop an engineering print by applying information they have learned in CDTD 111, 112, 121.

Students will understand the theories, perform, and troubleshoot computerized manufacturing simulations for both metal and plastic parts.

The second year Tool Design course is designed to develop skills in CAD tool design applications. The student will design various tooling including a jig, fixture, process sheets, checking gage, special machine components, welding applications, GD&T, and detailing.

The second year Die Design course will give the student the knowledge and ability to design various types of stamping dies. Operations such as piercing, blanking, forming, drawing, trimming and camming will be included in the design of compound and progressive dies. Press accessories and feeding mechanisms are studied as they relate to design problems. Safety standards will be applied to all assignments.

The second year Injection Mold Design class develops skills in the design of Plastics Injection Molds. Primary abilities and knowledge include: selecting proper mold bases, standard components, types of tool steels., and custom details. The synthesis of information pertaining to runner systems, gating scheme, cooling options, and proper ejection and their interacting consequences is a major

objective for this type of designing. The abilities developed, are to industrial standards.

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Students will be able to construct three dimensional solid models and be able to create proper engineering documentation of the component for production.

Students will understand the theories, perform, and troubleshoot computerized manufacturing simulations for both metal and plastic parts.

5 For each skill, ability or knowledge base listed in the previous question, identify the major component(s) of your curriculum that are designed to develop that characteristic in your graduate.

Projection, visualization and drafting skills are developed by the use of American Society of Mechanical Engineer (ASME) standards and related textbooks and workbooks. The use of lecture, power point and student participation is applied in the delivery of subject matter. Students are evaluated by test and lab application problems.

Advanced tolerancing and Geometric Dimensioning and Tolerancing is taught thruoght the program. The same ASME Y14.5M 1994 standards are used in this class. The National Standards drive most design applications. Some companies derive their own interpretation and applications. The use of ASME standards, related textbooks, product applications and parts are used. The use of lecture, power points, student evaluation of products with hands on application is applied. Students measure and evaluate products and provide a report on one of many manufacturing processes. Students are evaluated by test, lab applications, reports and measurement projects.

Students will meet course objectives through several design projects, lectures, tours, work sheets, internet research, terminology and design decisions.

Students will meet the course objectives through several design projects, lectures, tour and class work sheets.
Included is a course pack designed to assist students learn and understand design requirements, terminology, and component selection. Design decisions will be based on what students learn in class.

8 Describe the service provided to non-majors by this program.

- The CDTD program provides instruction of CDTD 150 Blueprint Reading and Analysis for the Manufacturing Tooling Program. The class is offered in the fall with two sections being offered.
- The CDTD program supports the ETEC 140 Engineering Technology classes. Many faculty teach loads of 23 contacts with 2 or 3 sections depending on enrollment and need. This is done in the Fall and Winter semesters.
- Rapid Prototyping is made available to all programs in the COT and across the University. This service is also made available to high schools and career centers on a per order basis.
- Mini-seminars have been provided to the Welding program students to give an update on AutoCAD software.
- Students from the Manufacturing Tooling Program have been trained and given assistance on reverse engineering with the FaroARM CMM machine.

12 How many full time tenured and tenure track faculty currently teach in this program? How many hold PhD degrees? MS or MA degrees? Other (please specify)?

The CDTD program faculty have the following credentials:

3 Tenured faculty with MS degrees

1 Tenured track faculty on his tenure year with a BS degree and approaching his MS degree.

1 Internationally Certified faculty in Geometric Dimensioning and Tolerancing.

No PhD degree in the program

12 With regard to the professional activities and accomplishments of the full time tenured or tenure track faculty who currently teach in this program:

- **How many have received a promotion or merit award in the last 5 years?**
- **How many have had a publication in a professional journal and/or presented a paper/poster at a professional meeting in the last 5 years?**
- **How many have attended a regional or national professional meeting in the last 5 years?**
- **How many have received a sabbatical leave during the last five years.**

2 Faculty have been promoted
1 Faculty has received merit award during the past five years.
3 Faculty have presented at two National Conferences and two State

Conferences over the past 5 years.

4 Faculty have attended the National Manufacturing Conference and National Tech Prep Conferences.

Zero faculty have had a sabbatical during the past five years.

One has applied.

The following questions or requests for information are the result of our discussion concerning specific statements or material within the Associate of Applied Science Degree in CAD Drafting Tool Design Technology Review Panel document. The page number containing the material upon which the question is based is cited prior to the question.

1-7 1-11 **In the Administrative Program Review, the capacity is listed as 86. On page 1-7 the target total enrollment is listed as 80. What is your real capacity and how do you determine that?**

The program needs to address the capacity issue. Our capacity is limited by our computer lab capacity. Our first year lab has the 22 computers with two sections being offered each semester. The second year tool design lab has 17 computers with two sections being offered each semester. This provides design stations for a total of 78 students based on the current curriculum. The capacity should be changed to reflect this.

1-7 1-11 1-12 10-1 **You indicate that there is no significant attrition, yet according to the Administrative Program Review your entering class is in the middle to upper 30's and your sophomore class is in the mid 20's. On page 10-1 you indicate that your attrition rate is 75% to 80%. Is this an acceptable rate?**

The program does see a number of students leave the program after the first year. This can be attributed to grades, change of programs or departure from the university due to lack of commitment. The program is seen as demanding and requires a commitment from the student. The faculty does not feel losing students because of grades or interest in the program is acceptable. But some change due to career interest is normal in today's society. Students entering the program do not have a clear understanding of the tool design field and what is required. We feel we are seeing a change in retention for the 2003/2004 year.

In the Administrative Program Review the number of sophomores listed is significantly less than the number of graduates listed. What are the factors that account for this? Do you find your graduation rate to be acceptable?

The program continually strives to graduate all of our sophomores. In some cases they are deficient in a class or two and some students continue on for a BS

degree without applying for the AAS degree. Through faculty advising we communicate our concern to the students and push to get them to graduate on time and apply for graduation. We take pride in seeing our student walk across the stage at graduation.

1-9 Have any specific actions been taken in addressing the weaknesses cited in this section? If so, what are they?

The following steps have been taken or are in place to help reduce the number of students leaving the program.

- Faculty advising: To insure students understand career options.
- FSUS 100 interaction with students and their future in Tool Design
- Created the Association of Tool Designers student organization.
- Recruiting activities that define what a tool designer is and what the design field has to offer.
- We want to implement a job shadowing experience.
- Field trips to tool design companies and related jobs.

1-10 Please elaborate on the statement that the Mechanical Design Department needs to have its own support staff and office area.

The department is too large for one support staff person. We need help with typing, ordering, documentation, billing of rapid prototyping services, minutes of meeting and general office support.

- **1 Secretarial staff person is required to support;**
  - **16 faculty, 6 programs: 4 Bachelor and 2 Associate**
  - **550 approximate number of students (approx 25% of the COT) not including off campus programs.**
- **Secretary support:**
  - **The support received is slow, cumbersome, and many times either late or incorrect.**
  - **Many marketing, mailings, and recruitment efforts are lost.**
  - **Some projects are not done on time and lack of commitment to a job and profession is lacking.**
  - **Many faculty end up doing much of the secretarial duties because of workloads and lack of experience or direction.**
- **Physical office area.**
  - **Visiting students looking at our program are frequently greeted by packages, faculty mail, program and department materials and general clutter.**
  - **Signing of papers, talking to the secretary and other office work is interrupted due to cramped space and size of departments.**

- **Phones and faxing is inconvenient due to location, type of phones and lack of space.**
- **There is no room for storage of department or program supplies. The general appearance needs improving.**

1-12 Please describe industry support for your program.

Our program has received industrial support over the years. Industry donations have helped in developing our new advanced tool design lab and the RP Center. In addition, we have received support for tours of various companies to see design and manufacturing operations. We have received donated parts, products. Industrial guest speakers and hiring of our graduates. Occurs frequently.

1-12 Please elaborate on the statement in the Administrative program review concerning the ETEC 140 and the statement concerning advanced solids related classes.

The ETEC 140 class is offered to several programs in the COT, but no program takes claim of the class. No ownership. The Mechanical Design Department has been the unofficial caretaker as far as assigning faculty for instruction. There are 6-8 sections in the fall. This is a continual problem with overload and adjunct faculty. Course content or structure of the class needs to be reviewed. We feel the ETEC class needs to be part of the CDTD program and have a dedicated faculty hired.

An advanced solid modeling course has been requested by many students and instructors from related programs. The common question from students that have an interest in CAD after completion of the ETEC-140 course is; "...can I take another course and continue to learn about this area...?" A special topics class has been offered 3 times and has had rave reviews and appreciation from the enrolled students. However, when a permanent class was pursued it was extinguished by administration, due to the course not being on any programs check sheet. The course does have support of several programs so students could take this as an elective much like an existing course that plastics offers for non-majors. The CDTD faculty see the need for advanced applications for individuals entering into the manufacturing sector and would like to offer this class to Ferris students at large.

1-14 Do you have any competitors with similar programs? If so, who are they?

Programs are offered by private schools like: Baker, and ITT. Public programs are offered at several community colleges but do not include Injection Mold Design and Metal Die Stamping, nor do the credits equal ours. Furthermore, graduates of these programs trying to transfer in to the BS programs at Ferris simply do not have the knowledge required to be successful.

While there are some programs that have tried to emulate our program, there is no program to our collective knowledge that offers the amount and quality of instruction that we provide.

We have seen the quality of graduate that our "competitors" have produced, and have been told by our advisory committee about their success of the same graduate, and the feeling is unanimous that the "competition" is poor at best.

5-9 Please explain the comment the concern expressed about interference of upper administration with program specific web pages.

The CDTD Program has had its own Web Page for several years. It was decided by upper administration (Dr. Cochran and/or COT Deans office) to implement a process by which web pages were to meet certain criteria and to be submitted for approval then up loaded to the web server to be used.

Authors were not consulted as to the problems with the existing pages and they were not directly informed of the desired changes. Furthermore, nothing was stated as to the process by which the pages were to be submitted, what format they were to be submitted in and what criteria was to be used within the pages for acceptance or rejection.

The frustration of this event and activities occur when faculty make an effort (on their own time) to improve the marketing via web pages for the benefit of Ferris and the program. The faculty was not given the opportunity for input before decisions are made and obstacles are put in place that impede the web development process.

8-1 What are your highest priorities with respect to the needs of the program?

- The highest priority is a plan to maintain computers and support equipment. This can be realized via a budget reallocation. An annual budget allocation that provides for updating and maintaining our equipment and systems is critical to the future of the program.

- The need to update our 503 Computer Lab has been identified by our advisory committee as a near term need (October 17th 03 meeting).

8-2

- The need for classroom furniture.

8-3

- The replacement of projection systems

12-2

- The increase of professional development monies.
- Addressing the MDSN office environment, and staffing issues.

What have you asked for in the Unit Action Plans?

- Upgrade facilities in Swan 502/503
- 3D Laser Scanning/Digitizing System
- Advanced Applications Lab
- Bosch Mold Actuator

8-3 **Please describe the Rapid prototyping center and indicate how this will be used to expose high school students to what Ferris has to offer.**

The RPC is a unique endeavor that was conceptualized by the faculty of the CDTD program to introduce and make available high-tech capabilities to Ferris students and any high school/career center program at a minimal cost to cover material expenses. This provides students with experience on

The methods of producing rapid prototyping models and what industry does with the prototypes. Within the state of Michigan all students that are enrolled in a high school or career center CAD drafting program, that has solid modeling in the curriculum, have access to the Ferris State University RP systems. Via the Web (Ferris web pages) high school instructors will be able to instruct their students on RP concepts. The student's RP model is viewed during its creation via a Web-Cam. The models are then mailed to the instructors for the students to use. This has given great exposure to what a career in the design field has to offer. We have numerous tours visit the facilities and participate in this program. We feel that our increase in enrollment is partially because of this. High school and middle school students will be motivated to explore the manufacturing field because of the experience.

13-3 Is their sufficient demand to justify a minor in CAD design?

The faculty have discussed the possibility of offering a minor in CAD and design but the demand for this is not clear. We would need to do further studies and surveys to warrant a minor in CAD. Because of the number of hours required for a minor it would be unlikely that the demand would be significant enough, but a certificate could be considered.

App D Please provide your insight as to why CDTD 130 appeared to be singled out for negative comments by students.

The CDTD 130 class is a new class. After consulting with our advisory committee, we implemented changes to the curriculum. To be specific, projects and assignments will be more sequential from introductory to more difficult assignments. This will provide a foundation for students to build on.

Three observations were made:

1. The class has several concepts that are very difficult for freshman with little experience to understand, apply and relate to.

2. Simultaneously, the students take a Solids Modeling class that is easier to relate to and conceptualize.

3. 13 students were caught cheating which may explain some of the negativity.

At our most recent Advisory Committee meeting (October 17, 03) the committee indicated strong support for the class and its objectives.

CRITERIA SUMMARY FOR:
AAS DEGREE IN CAD DRAFTING AND TOOL DESIGN

CATALOG DESCRIPTION:

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Graduate surveys were returned from 121 grads. (page 2-5) The exact comments were reported. (Appendix B)

Employer survey was mailed to 220 employers. Seventy were returned for insufficient address. Of the 150 mailings that reached employers, 52 were returned (34.7% return rate). (page 3-1) The exact comments were reported. (page 3-5)

There were 55 responses to the student evaluation form. The exact comments were reported. (Appendix D)

Advisory surveys were sent out to 11 board members and 5 were returned. (page 6-2) The exact comments were reported. (Appendix F)

SPECIFIC CRITERIA:

- **CENTRALITY TO FSU MISSION:**

  Ferris State University will be a national leader in providing opportunities for innovative teaching and learning in career-oriented, technological and professional education.

  The program provides hands-on, laboratory based career education and training incorporating current technology. (page 1-4) This program is directly related to the mission of Ferris State University.

- **UNIQUENESS AND VISIBILITY OF PROGRAM:**

  No other program with this title is found at other universities in the state. (page 12-1) This is the only 2-year program in Michigan with such a strong emphasis on tool design. (page 1-14) Programs in computer aided design are offered by private schools like Baker and ITT. Public programs are offered at several community colleges but do not include Injection Mold Design and Metal Die Stamping, nor do the credits equal those in this program. Furthermore, graduates of these programs trying to transfer in to the BS programs at Ferris simply do not have the knowledge required to be successful.

  The CDTD program articulates with many High Schools, Career Centers, and Community Colleges.

  The program faculty offer CAD summer camps, has developed posters with tear off cards that are placed in the classrooms in schools, and schedules tours of the facilities and visits to high schools. Faculty members have attended the National Technical Preparation Conference and State of Michigan Governors conference last two years. (page 10-1) With the program presenting at state and national conferences the program has also gained a national exposure and reputation. (page 12-1)

- **SERVICE TO STATE, NATION, WORLD:**

  This program is a provider of CAD/draftsman for Product, Tool, Die, Gage, and Injection Mold designer to the State of Michigan as well as the Great Lakes region. (page 1-1) With tool design being the foundation for all manufacturing process, graduates with tool design skills are highly sought after. (page 12-1)

- **DEMAND BY STUDENTS:**

  Enrollment has been stable. (page 1-2) According to the Administrative Program Review, enrollment has increased slightly from 69 in the fall of 1998 to 74 in the fall of 2002. The program can accept 46 freshman (the targeted enrollment is 80 but 78 is a more realistic capacity). Last year the program had 65 prospects and enrolled 44. (page 1-7) This fall there are 48 freshman and 31 sophomores in the program.

  The retention rate is consistently 75% to 80% (page 10-1) Most of the students who leave the program remain at Ferris enrolling in another program. A significant number of student transfer into BS programs at Ferris.

- **DEMAND FOR, PLACEMENT OF, AND AVERAGE SALARY OF GRADUATES:**

  Graduates of the CAD Drafting Tool Design Technology program are able to seek gainful, career positions in industry after completion of this 2 year program. Many graduates are able to ladder into the Product Design, Manufacturing Engineering, Career Technical Education, Mechanical Engineering Technology and Plastic Bachelors Degrees. (page 1-1)

Graduates for this program consistently pursue advanced degrees at other institutions. (page 1-4) Approximately 60%- 75% continue their education at FSU in the BS Engineering Technology programs. (page 1-14) There is 100% placement of students seeking employment. (page 7-3) The survey data suggests that the average starting salary is $27,000.

- **SERVICE TO NON-MAJORS:**
  - The CDTD program provides instruction of CDTD 150 Blueprint Reading and Analysis for the Manufacturing Tooling Program. The class is offered in the fall with two sections being offered.
  - The CDTD program supports the ETEC 140 Engineering Technology classes. Many faculty teach loads of 23 contacts with 2 or 3 sections depending on enrollment and need. This is done in the Fall and Winter semesters.
  - Rapid Prototyping is made available to all programs in the COT and across the University. This service is also made available to high schools and career centers on a per order basis.
  - Mini-seminars have been provided to the Welding program students to give an update on AutoCAD software.
  - Students from the Manufacturing Tooling Program have been trained and given assistance on reverse engineering with the FaroARM CMM machine.
- **QUALITY OF INSTRUCTION:**

The quality of the program can be demonstrated by the quality and quantity of job placement. (page 1-8) There is the constant pursuit by the faculty for additional degrees and attendance at workshops, seminars and conferences. The faculty uses WebCT and digital presentations in instruction. (page 1-8) Student surveys indicate that the quality of instruction is high. (page 4-1)

- **FACILITIES AND EQUIPMENT:**

The program has three labs. Swan 502 is a Drafting lab, Swan 503 and 504 are CAD and CAE labs which seat 24 and 17 students respectively. (page 1-5) The program has received vocational education funds and approximately $12,000 during the past five years in donations for lab upgrade. The program has received industrial support over the years. Industry donations have helped in developing the new advanced tool design lab and the RP Center. In addition, the program has received support for tours of various companies in order to see design and manufacturing operations. It has also received donated parts and products. During the last five years, the program has received in excess of $108,000 dollars for equipment.. (page 1-5)

The program quality is at risk because of its dependence on high-end computers and software without a solid University of College developed plan for replacement. (page 1-9)

Improvement needs to be made in much of the classroom environment in the form of lighting, furniture and furnishings, and carpet. (page 12-2)

- **LIBRARY INFORMATION RESOURCES:**

  The library resources are appropriate with full access for faculty and students. The library provides technical support staff. (page 1-6)

- **COST:**

  According to the 2000-2001 report from institutional research:

	Total cost per SCH
AAS Degree in CAD Drafting and Tool Design	$261.68
	Total program cost
AAS Degree in CAD Drafting and Tool Design	$17,532.69

- **FACULTY:**
  - **QUANTITY AND QUALIFICATIONS:**
    - In this program there are 3 tenured faculty with MS degrees, 1 tenured track faculty on his tenure year with a BS degree and approaching his MS degree and 1 Internationally Certified faculty in Geometric Dimensioning and Tolerancing.
  - **PROFESSIONAL AND SCHOLARLY ACTIVITIES:**
    - Three of the four faculty have received a promotion or merit award during the last five years.
    - Zero of the four faculty have been awarded a sabbatical leave during the last five years.
    - Four of the four faculty have attended a regional or national professional meeting in the last 5 years.
    - Three of the four faculty have had a paper published and/or made a presentation/poster session at a professional meeting during the last five years.
- **ADMINISTRATIVE EFFECTIVENESS:**

  The college of Technology administrative support for program funding has been marginal at best. There has been a slight increase in S&E. The COT and FSU administration has not taken a proactive position to work with the CDTD program to establish an equipment and software initiative. (page 12-2)

  The CDTD Program has had its own Web Page for several years. It was decided by upper administration (Dr. Cochran and/or COT Deans office) to implement a process by which web pages were to meet certain criteria and to be submitted for approval then up loaded to the web server to be used.

Authors were not consulted as to the problems with the existing pages and they were not directly informed of the desired changes. Furthermore, nothing was stated as to the process by which the pages were to be submitted, what format they were to be submitted in and what criteria was to be used within the pages for acceptance or rejection.

The frustration of this event and activities occur when faculty make an effort (on their own time) to improve the marketing via web pages for the benefit of Ferris and the program. The faculty was not given the opportunity for input before decisions are made and obstacles are put in place that impede the web development process.

The department is too large for one support staff person. The program needs help with typing, ordering, documentation, billing of rapid prototyping services, minutes of meeting and general office support.

- One Secretarial staff person is required to support;
  - 16 faculty, 6 programs: 4 Bachelor and 2 Associate
  - 251 approximate number of students (approx 10% of the COT) not including off campus programs.
- Secretary support:
  - The support received is slow, cumbersome, and many times either late or incorrect.
  - Many marketing, mailings, and recruitment efforts are lost.
  - Some projects are not done on time and lack of commitment to a job and profession is lacking.
  - Many faculty end up doing much of the secretarial duties because of workloads and lack of experience or direction.
- Physical office area.
  - Visiting students looking at our program are frequently greeted by packages, faculty mail, program and department materials and general clutter.
  - Signing of papers, talking to the secretary and other office work is interrupted due to cramped space and size of departments.
  - Phones and faxing is inconvenient due to location, type of phones and lack of space.
  - There is no room for storage of department or program supplies. The general appearance needs improving.

Draft
Criteria Summary for
AAS Degree in CAD Drafting and Tool Design

CATALOG DESCRIPTION:

Why Choose CAD Drafting and Tool Design Technology?

The CAD Drafting and Tool Design program concentrates on the use of CAD in product drawing, dies (metal stamping), molds (plastic processes) and jig, fixture and gauge design. Students are involved with computers throughout the program to familiarize them with CAD software and applications such as detailing, GD & T, general tolerancing, wire frame, surfacing, solid modeling with parametric technology and Rapid Prototyping. Computer-aided engineering software for mold design and mechanical applications are also used. Student solid models are processed and created on our Rapid Prototyping equipment.

Tool design is critical to the manufacturing industry. Tooling is the foundation for product design and the manufacturing industry. Students learn to design and detail basic tooling requirements for the manufacture of products. Consideration for safety of the design and manufacturing processes are also emphasized. Students also gain an understanding of the related areas of mathematics, materials and machining.

Prepare for a Great Career

Converting an abstract idea into a working design is the job of the drafter and tool designer. The drafter/designer may be involved in drawing one of many parts of a complete assembly, then designing the tooling-jigs, fixtures, gauges, dies, injection molds and special machines-to produce one or all of those parts.

For the drafter/tool designer, creativity and attention to detail are essential in production of such diverse products as automotive and aircraft components, consumer products, medical products, electronics, food processing and special machinery.

Graduates of the program find immediate employment as computer-aided tool detailers, product drafters, entry-level tool designers, CAD operators and other technical-related positions. Many students choose to continue into B.S. programs such as Product Design Engineering Technology, Manufacturing Engineering Technology, Plastics Engineering Technology, Business Management or Occupational (Teacher) Education.

Admission Requirements

Admission to the College of Technology is open to high school graduates who demonstrate academic preparedness, maturity and seriousness of purpose with backgrounds appropriate to their chosen program of studies. Among first-time students in our technical programs, the average high school GPA is 2.8, and the average ACT composite score is 20.

Students entering the CAD Drafting and Tool Design Technology program should have a background in CAD and a desire to develop tool design skills. Admission is open to high

school graduates with a minimum 2.0 GPA and a minimum ACT math subscore of 15 (19 recommended).

Graduation Requirements

The CAD Drafting and Tool Design Technology program at Ferris leads to an associate in applied 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 in the General Education section of the University Catalog.

BACKGROUND INFORMATION OBTAINED FROM THE REVIEW PROCESS:

This program is housed in the Mechanical Design Department of the College of Technology. This department is composed of 16 faculty, 6 programs (4 Bachelor and 2 Associate) and serves 251 students (approx 10% of the COT) not including off campus programs.

Enrollment has been stable. (page 1-2) According to the Administrative Program Review, enrollment has increased slightly from 69 in the fall of 1998 to 74 in the fall of 2002. The program can accept 44 freshman (the targeted enrollment is 80 but 78 is a more realistic capacity). Last year the program had 65 prospects and enrolled 44. (page 1-7) This fall there are 48 freshman and 31 sophomores in the program.

Graduate surveys were returned from 121 grads. (page 2-5) The exact comments were reported. (Appendix B)

Employer survey was mailed to 220 employers. Seventy were returned for insufficient address. Of the 150 mailings that reached employers, 52 were returned (34.7% return rate). (page 3-1) The exact comments were reported. (page 3-5)

There were 55 responses to the student evaluation form. The exact comments were reported. (Appendix D)

Advisory surveys were sent out to 11 board members and 5 were returned. (page 6-2) The exact comments were reported. (Appendix F)

SPECIFIC CRITERIA:

- **CENTRALITY TO FSU MISSION:**

  Ferris State University will be a national leader in providing opportunities for innovative teaching and learning in career-oriented, technological and professional education.

  The program provides hands-on, laboratory based career education and training incorporating current technology. (page 1-4) This program is directly related to the mission of Ferris State University.

- **UNIQUENESS AND VISIBILITY OF PROGRAM:**

  No other program with this title is found at other universities in the state. (page 12-1) This is the only 2-year program in Michigan with such a strong emphasis on tool design. (page 1-14) Programs in computer aided design are offered by private schools like Baker and ITT. Public programs are offered at several community colleges but do not include Injection Mold Design and Metal Die Stamping, nor do the credits equal those in this program. Furthermore, graduates of these programs trying to transfer in to the BS programs at Ferris simply do not have the knowledge required to be successful.

  The CDTD program articulates with many High Schools, Career Centers, and Community Colleges.

  The program faculty offer CAD summer camps, has developed posters with tear off cards that are placed in the classrooms in schools, and schedules tours of the facilities and visits to high schools. Faculty members have attended the National Technical Preparation Conference and State of Michigan Governors conference last three years. (page 10-1) With the program presenting at state and national conferences the program has also gained a national exposure and reputation. (page 12-1)

- **SERVICE TO STATE, NATION, WORLD:**

  This program is a provider of CAD/draftsman for Product, Tool, Die, Gage, and Injection Mold designer to the State of Michigan as well as the Great Lakes region. (page 1-1) With tool design being the foundation for all manufacturing process, graduates with tool design skills are highly sought after. (page 12-1)

- **DEMAND BY STUDENTS:**

  Enrollment has been stable. (page 1-2) According to the Administrative Program Review, enrollment has increased slightly from 69 in the fall of 1998 to 74 in the fall of 2002. The program can accept 44 freshman (the targeted enrollment is 80 but 78 is a more realistic capacity). Last year the program had 65 prospects and enrolled 44. (page 1-7) This fall there are 48 freshman and 31 sophomores in the program.

  The retention rate is consistently 75% to 80% (page 10-1) Most of the students who leave the program remain at Ferris enrolling in another program. A significant number of student transfer into BS programs at Ferris.

- **DEMAND FOR, PLACEMENT OF, AND AVERAGE SALARY OF GRADUATES:**

  Graduates of the CAD Drafting Tool Design Technology program are able to seek gainful, career positions in industry after completion of this 2 year program. Many graduates are able to ladder into the Product Design, Manufacturing Engineering, Career Technical Education, Mechanical Engineering Technology and Plastic Bachelors Degrees. (page 1-1)

Graduates for this program consistently pursue advanced degrees at other institutions. (page 1-4) Approximately 60%- 75% continue their education at FSU in the BS Engineering Technology programs. (page 1-14) There is 100% placement of students seeking employment. (page 7-3) The survey data suggests that the average starting salary is $27,000.

- **SERVICE TO NON-MAJORS:**
  - The CDTD program provides instruction of CDTD 150 Blueprint Reading and Analysis for the Manufacturing Tooling Program. The class is offered in the fall with two sections being offered.
  - The CDTD program supports the ETEC 140 Engineering Technology classes. Many faculty teach loads of 23 contacts with 2 or 3 sections depending on enrollment and need. This is done in the Fall and Winter semesters.
  - Rapid Prototyping is made available to all programs in the COT and across the University. This service is also made available to high schools and career centers on a per order basis.
  - Mini-seminars have been provided to the Welding program students to give an update on AutoCAD software.
  - Students from the Manufacturing Tooling Program have been trained and given assistance on reverse engineering with the FaroARM CMM machine.
- **QUALITY OF INSTRUCTION:**

The quality of the program can be demonstrated by the quality and quantity of job placement. (page 1-8) There is the constant pursuit by the faculty for additional degrees and attendance at workshops, seminars and conferences. The faculty uses WebCT and digital presentations in instruction. (page 1-8)

- **FACILITIES AND EQUIPMENT:**

The program has three labs. Swan 502 is a Drafting lab, Swan 503 and 504 are CAD and CAE labs which seat 22 and 17 students respectively. (page 1-5) The program has received vocational education funds and approximately $12,000 during the past five years in donations for lab upgrade. The program has received industrial support over the years. Industry donations have helped in developing the new advanced tool design lab and the RP Center. In addition, the program has received support for tours of various companies in order to see design and manufacturing operations. It has also received donated parts and products. The program has received in excess of $108,000 dollars for equipment. (page 1-5)

The program quality is at risk because of its dependence on high-end computers and software without a solid University or College developed plan for replacement. (page 1-9)

Improvement needs to be made in much of the classroom environment in the form of lighting, furniture and furnishings, and carpet. (page 12-2)

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    - Three of the four faculty have received a promotion or merit award during the last five years.
    - Zero of the four faculty have been awarded a sabbatical leave during the last five years.
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The department is too large for one support staff person. The program needs help with typing, ordering, documentation, billing of rapid prototyping services, minutes of meeting and general office support.

- One Secretarial staff person is required to support;
  - 16 faculty, 6 programs: 4 Bachelor and 2 Associate: This includes the EET/CNS Department and the Mechanical Design Department:
  - 425 approximate total number of students enrolled in the following programs.

    EET/CNS: 194

    MET: 109

    PDET: on campus 43

    CDTD: 79

    Total: 425 (approx 18% of the COT) not including off campus programs.

    The Secretary also supports students in our related classes:

    EET/CNS classes: 112 students

    ETEC 140: 120 students
- Secretary support:
  - The support received is slow, cumbersome, and many times either late or incorrect.
  - Many marketing, mailings, and recruitment efforts are lost.
  - Some projects are not done on time and lack of commitment to a job and profession is lacking.
  - Many faculty end up doing much of the secretarial duties because of workloads and lack of experience or direction.
- Physical office area.
  - Visiting students looking at our program are frequently greeted by packages, faculty mail, program and department materials and general clutter.
  - Signing of papers, talking to the secretary and other office work is interrupted due to cramped space and size of departments.

- Phones and faxing is inconvenient due to location, type of phones and lack of space.
- There is no room for storage of department or program supplies. The general appearance needs improving.

November 14th, 2003

Clarification of CDTD Program Budget Needs
Submitted by the CDTD Faculty

The CAD Drafting Tool Design faculty would like to respond to the CDTD faculty presentation to the Academic Program Review Committee. We would like to clarify our position on computers and equipment maintenance issues.

The program faculty also had informal discussions with the Interim Dean of the College of Technology on some of the same topics.

As discussed in our meeting, the program needs to establish a plan for replacement of computers and maintenance of existing equipment.

- Currently the existing CDTD Supply and Equipment budget does not provide funds for computers and maintenance purpose. The current budget is being used for materials for the Rapid prototyping room, digitizing room, printing, plotting, projection systems, student field trips, faculty development activities and general materials for the classroom.
- While some programs in the COT have significant S&E budget funding for their program needs, the CDTD program feels or current budget does not come close to supporting our equipment and supply needs. In the past drawing boards and paper were our primary needs. Today, in our curriculum, computers, advanced applications (RP) and delivery methods (computers and projectors) are our primary tools.
- The current system for funding via the Unit Action Plan/Voc-Ed doesn't meet the needs of the program.
    - Historically the CDTD program has primarily focused on computers for the classroom. In recent years the program has requested equipment for advanced design applications. (Rapid Prototyping and digitizing)
    - The current department structure of multiple programs submitting their needs versus a single program, in a department, works against program equity. This means that each year, our department rotates the number one UAP priority between three programs. In essence our program has an opportunity to receive funds for our number one priority once every three years.

Based on the current structure of funding equipment, we are requesting the program budget be investigated and compared to other programs within the COT.

Conservative estimates of program budget needs are between approximately $45,000 and $50,000 dollars on an annual basis.

The following will provide a rational for our proposal.

- We currently have no maintenance agreements for our rapid prototyping equipment. Maintenance contract on each machine is $3000 per year for one and $6000. We choose not to purchase a maintenance contract due to budget constraints but this leaves us vulnerable for maintenance costs.
- For us to replacement of one of the three computer labs per year, we feel the following plan should be implemented.

  Every July, 24 new high end computers would be purchased and distributed in the following way: We will call these 2004 computers.

17	Computers for Swan 504 advanced design lab.
1	Computer for lecture station
1	Computer RP/Digitizing Lab
1	Computer for lecture station in Swan 502
4	Faculty computers for offices (curriculum development)

- The next July, 24 new computers would be purchases and replace the computers listed above. The computers purchased for 2004 would be removed from their current location and place in Swan 503.

22	Computers for students in Swan 503
1	Computer for lecture station in 503
1	Computer for RP/Digitizing area.

This means there will never be a computer older than two years to run high end applications for CDTD students and other users.

- The next July, this cycle repeats but the computers in Swan 503 would be moved to Swan 105A to be used for all programs that have ETEC-140 as a requirement. Swan 105A is made available to all students in the COT.
- Once the three year cycle has been completed the computers in Swan 105A would be made available for to the campus community for their use. (faculty, secretaries, other programs)
- This cycle continues to occur on an annual basis. This budget assumes that we can purchase higher powered computers between $1,500 and $1,750.

CAD DRAFTING TOOL DESIGN TECHNOLOGY

ASSOCIATE OF APPLIED SCIENCE

SELF STUDY

FOR

ACADEMIC PROGRAM REVIEW

Ferris State University
College of Technology
Mechanical Design Department

September 2003

SELF STUDY FOR ACADEMIC PROGRAM REVIEW

CAD DRAFTING TOOL DESIGN TECHNOLOGY

ASSOCIATE OF APPLIED SCIENCE

College of Technology
Ferris State University

2003 - 2004

PROGRAM REVIEW PANEL:

Program Faculty:

Todd Rose, Co-Chair, Associate Professor
CAD Drafting Tool Design Technology

Rick Eldridge, Co-Chair, Associate Professor
CAD Drafting Tool Design Technology

Mark Hill, Professor
CAD Drafting Tool Design Technology

Dan Wanink, Assistant Professor
CAD Drafting Tool Design Technology

Ferris Faculty Member:

Clyde Hardman, Associate Professor
Computer Information Systems, College of Business

Individual with special interest in the Program:

Tom Crandell, Director, Technology Transfer Center

Department Chair:

Chuck Drake, Professor, Department Chair, Mechanical Design Department

Submitted:
September, 2003

TABLE OF CONTENTS

SECTION 1

OVERVIEW OF PROGRAM

A. MISSION OF THE CAD DRAFTING TOOL DESIGN TECHNOLOGY PROGRAM

To provide students with the ability to succeed academically and become independent problem solvers. The program strives to provide students with the necessary skills in computer aided design and tool design to meet the needs of industry.

B. PROGRAM HISTORY

The foundation for skilled designers and one of the major support programs to Bachelor's Degrees is the CAD Drafting Tool Design program. The CAD Drafting Tool Design program has its origin as the Mechanical Drafting program in 1947 with seven students. Today with over 1,260 graduates, it is one of the primary providers of students into the Product Design, Manufacturing Engineering, Career Technical Education, Mechanical Engineering Technology and Plastics Bachelors Degrees with the 2+2 laddering concept at Ferris State. The CAD Drafting Tool Design program is a critical component to the overall success of graduates from the Design and Manufacturing BS degree programs. Graduates are able to seek gainful, career positions in industry after completion of the two year CAD Drafting and Tool Design program if they elect not to earn a bachelor's degree. Several of our graduates have accepted employment and continued their education at our campus in Grand Rapids or our satellite campuses.

The CAD Drafting Tool Design program is an applied technology program and is a provider of CAD/draftsman for Product, Tool, Die, Gage, and Injection Mold designers to the State of Michigan as well as the Great Lakes region of the United States. With a major initiative for CAD/CAM (Computer Aided Drafting and Computer Aided Machining) applications in the fall of 1983, the CAD Drafting Tool Design program started a major change in curricula. Many major changes in applied CAD/CAM and related technologies have been incorporated into the curriculum during the past twenty years. Advisory committee, industry surveys, alumni surveys and faculty plans have been identified and implemented to make the CAD Drafting Tool Design current to industries needs and requirements.

One of the most significant changes in industry has been the use of prototyped products and the new technologies to generate them. The CAD Drafting Tool Design program has responded by developing its own Rapid Prototyping Center. We are able to provide students with the latest technology as well as working with all the high school programs and career centers in Michigan.

C. CURRENT PROGRAM STATUS

Support for the various CAD/CAM labs that the CAD Drafting Tool Design Program uses have come from two major sources. The initial CAD/CAM lab that the CAD Drafting Tool Design program used was the former college wide "CAD/CAM lab" which was an open lab for all college of technology students. We then used Vocational Education (Voc. Ed.) funds to establish a dedicated CAD lab for its students. More recently we obtained donations from industry and revitalization funds from the university and have opened a new "state of the art" CAD lab used by our second year students. This planning and implementation of the new lab was vital to the continued success of our program.

The CAD Drafting Tool Design program has worked with a consistently reduced budget the past several years. The cost of supplies and equipment are on a constant rise we do not receive sufficient funds from the College of Technology department budget. Donations from industry and faculty as well as passing along some costs to the students have allowed the CAD Drafting Tool Design program to remain status quo. Annual discussions of the future availability and amounts of vocational educational funds for computers, supplies and equipment will need attention.

Enrollment in the CAD Drafting Tool Design program has been stable. The faculty has implemented a basic strategy for recruitment at schools that have consistently sent high school graduates to the CAD Drafting Tool Design program. Our continued efforts to work with high school programs to attract students as well as summer programs, we believe, has increased the interest and enrollment in our program.

Placement in the CAD Drafting Tool Design program is consistent with other "feeder programs" at Ferris State. High numbers of CAD Drafting Tool Design graduates go on for a BS degree. The program continues to monitor the equipment and facilities with the hope of establishing software and equipment replacement initiatives for the programs continued success. Many companies have visited Ferris State campus in hopes of recruiting CAD Drafting Tool Design graduates. Those lucky enough to hire our graduates often call or write indicating that the

students are well prepared and "do you have any more like the one I hired". Many graduates respond back in a similar tone as can be seen in comments in Section 2 of this report. The CAD Drafting Tool Design program has long been recognized as a leader in providing highly qualified entry-level Tool Designers and CAD operators for industry. The program has developed a Rapid Prototyping Center (RPC) and an advanced inspection area. The RPC and inspection area is being used by our students and College of Technology students and is made available to all programs at Ferris State University. The advanced equipment and design capability has also provided an excellent recruiting tool.

SECTION 1

PROGRAM PROFILE

Program: CAD Drafting Tool Design Technology
Degrees: A.A.S.
Department: Mechanical Design Department
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.

The CAD Drafting Tool Design Technology degree is designed to prepare students to enter industry as technical draftsmen, detailers entry level tool designers and CAD operators.

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

The program is compatible with the FSU mission statement, by providing hands-on, laboratory based career education and training incorporating current technology.

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

In addition to serving its majors, the CAD Drafting/Tool Design program provides courses for Manufacturing Tooling Technology majors. Faculty teach Engineering Graphics and CAD courses for the Welding Technology, Plastic Engineering Technology program, Heavy Equipment, Electronics and Mechanical Engineering programs. The CDTD program ladders into the B.S. Manufacturing Engineering Technology, Product Design Engineering Technology, Plastics Engineering Technology, Mechanical Engineering Technology and Career & Technical Education programs.

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

Graduates from the CAD Drafting Tool Design program consistently pursue advanced degrees at other institutions. The CDTD program articulates with many High Schools, Career Centers and Community Colleges.

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.

a. Tenure-track

See attached Personnel Profiles.

b. Adjunct N/A

c. Temporary, full-time and part-time N/A

2. *FTE overload*
   FTE overloads are above average.

3. *Off-campus programs: location and involvement of faculty*
   Off-campus programs do not apply to the CAD Drafting/Tool Design program.

4. *Administration: degrees (including year, field of study, and institution), certificates, and/or related work experiences.*
   Administration
   a. Chuck Matrosic, Interim Dean, College of Technology

   b. Randy Stein, Department Chair
      Assistant Professor Mechanical Engineering Technology

5. *Support staff (clerical, technical, . . .)*
   One clerical and no technical support staff shared with 6 other programs.

6. *Student assistants*
   Students (tutors) assistants and laboratory aids (maintenance) are hired as required to support laboratory activities and maintenance.

7. *Advisory committee: names, affiliations, and positions of the membership*
   Advisory board member list. (See Appendix F Advisory Committee)

B. *Instructional Resources*

1. *Describe, in general, the facilities (classroom, lab clinic, etc.) and equipment available to the program.*
   The CAD Drafting/Tool Design program has three labs, Swan 502, 503, and 504. Swan 502 is a Drafting lab, while Swan 503 and 504 are CAD and CAE labs, which seats 24 and 17 respectfully.

2. *Supplies and expense budget*
   Supplies and expense budget for past five academic years.

98/99	99/00	00/01	01/02	02/03
$9067	$12714	$17228	*$32311	$16231

   *(See Administrative Program Review attachment)
   *Amounts are actual funds spent and not true S&E budgets.

3. *Equipment acquisition budget*
   Equipment acquisition budget for the past five academic years.
   No formal budget
   *Voc. Ed. dollars are inconsistent for the program.

4. *Gifts and Grants*
   Gifts, Grants, and Consignments for past five academic years.
   The program has received approximately $12,000 during the past five years in donations to our program for lab upgrade.
   The program has received in excess of 108,000 dollars for equipment.

5. *Travel budget (faculty and administration, separately)*
   Travel Budget was $0. Funds were provided from CAD Drafting Tool Design local account.

6. *Professional development, other than travel, budget*
   There are no Professional Development Funds assigned for each faculty member. The program has received approximately $2,700 in professional development grants.
7. *Library resources*
   Library resources are appropriate with full access for faculty and students. The Library provides technical support staff.

C. *Describe faculty activities other than instruction, e.g.*
   1. *Faculty Activities*
      Committee involvement: program, department, college, university, state, and national levels.
      Each faculty member serves or has served on department, college and/or university committees.

   2. *Professional organizations*
      Faculty at various times, have been members of the Society of Manufacturing Engineering and ASEE American Society of Engineering Educators.

   3. *Publications*
      Faculty members have presented papers on Rapid Prototyping at the local, state national and international levels. The CDTD program was featured in an article entitled Rapid Prototyping goes to College of Time Compression Magazine.

   4. *Consulting*
      All faculty members are actively involved in consulting on a continual basis. These experiences help to keep their expertise relevant for the students. Computer, CAD, blueprint, and GD&T are typical areas of expertise. Refer to faculty profiles for additional areas.

III. Enrollment, Recruitment and Retention

A. *Enrollment trends for the past five years.*
   1. *Student credit hours/FTE.*
      98/99 99/00 00/01 01/02 02/03
      SCH/FTEF Unknown (Refer to Section 10)

   2. *Majors (on-campus and off-campus, separately).*
      98/99 99/00 00/01 01/02 02/03
      A.A.S. (Refer to Section 10) Note: No off-campus programs

3. *Graduates (on-campus and off-campus, separately).*

98/99	99/00	00/01	01/02	02/03
A.A.S. (Refer to Section 10)				

Note: No off-campus program.

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

98/99	99/00	00/01	01/02	02/03
% Placed (Refer to Section 10)				

5. *Graduates promotability and advancement.*

Graduates enjoy outstanding career mobility. Alumni are located in over 9 states. Graduates are making more than $50,000 per year. Several of the Alumni either hold or are pursuing a graduate degree. (See Section 2).

6. *Program capacity.*

With current resources, the program can accept 46 freshmen (2 sections of 23). Targeted total enrollment is 80.

B. *Recruitment*

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

Various faculty

a. Visit 8-12 high schools per year.
b. Participate in Admission programs
c. Participate in homecoming activities.
d. Write and administer the NOCTI drafting test.
e. Summer camps.
f. Have judged drafting contests.
g. Provide tours and demonstrations to visiting high school and career centers.

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

During the 2002-03 school year we had approximately 65 prospects. The program enrolled 44 freshmen for Fall 2003.

C. *Retention.*

1. *Are there any identifiable retention problems associated with the program?*

There are no significant retention problems.

2. *What efforts are being exerted to resolve retention issues? Assess program achieved in this area.*

Because of the FSU student Association of Tool Designers and the faculty commitment to student advising the program has had good retention.

3. *Describe activities of program-related student organizations.*
   Some SME membership as well as technical speakers from industry, plant tours, and technical symposium are available to CAD Drafting/Tool Design students. The CAD Drafting/Tool Design group also skis, golf and plays softball each year. The CDTD program sponsors a recognized student organization called FSU Association of Tool Designers. Approximately 40% of the students are member.

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.

IV. Effectiveness of the program.

A. Curriculum

1. *What are the graduate requirements?*
   See attached check sheets.

2. *Include a suggested semester-by-semester sequence of courses to be completed.*
   See attached check sheets.

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

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, etc.)?*
   Quality and quantity of job placement.

2. *What approaches are utilized to enhance the quality of instruction?*
   Constant pursuit by the faculty for additional degrees and attendance at workshops, seminars, and conferences. Faculty including WebCT and Web pages and digital presentations for delivery instruction.

3. *How is the student performance assessed?*
   Examinations, quizzes, term papers, laboratory projects, reports, oral presentations, discussion with employers.

4. *How is the quality of instruction measured?*
   Student evaluations, peer evaluations, and alumni evaluations, and industrial evaluations.

5. *How are the course contents kept current?*
   Annual Advisory Board program review, industry input, alumni surveys, and employer feedback. Annual faculty visits to industry and technical shows.

6. *How is the success of graduates gauged?*
   Initial employment in their field and Alumni surveys. Direct contact with employers.

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

Advantages

a. High faculty/student contact.
b. Use of current technology.
c. Expert faculty members.
d. Articulation agreements.
e. Superior feeder to B.S. laddering programs.
f. Diverse education.

Disadvantages

An inadequate capital equipment budget and faculty development budget. The program quality is at risk because of its dependence on high-end computers and software without a solid University or College developed plan for replacement.

V. 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.

2. *What are the results in responses to the measures executed?*
   To date, administrative cost reduction and initial recognition of program financial constraints. Stability of curriculum and programs future.

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

1. *What are the environmental factors which pose threats or present opportunities for the program (e.g. political, cultural, economic, fiscal, administrative, organization, curricular, technical, social)?*
   Budgetary constraints continue to restrict the CDTD programs ability to pursue new technologies. Opportunities have been squelched due to lack of support staff; i.e. secretarial, adult part time position, grant writing and chain of command.

2. *What impact will these factors have on the program?*
   a. Enrollment and graduates lattering into B.S. programs
   b. Quality of program
   c. Impact of the future focus/direction of the program
   d. Lack of fiscal and technical support will affect curriculum and future enrollment.

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

A budget reorganization to reflect the S&E as well as the capital equipment should be reflected as follows;

$25,000 per year S&E and Maintenance
$50,000 per year capital equipment

The Mechanical Design Department needs to have its own support staff and office area.

Program/Depart: **Pre-CAD Drafting Tool Des. Tech./CAD Drafting Tool Design Tech. / Mech. Design Dept.**
Date Submitted: **January 28, 2003**

Please provide the following information:

Enrollment

	Fall 1998	Fall 1999	Fall 2000	Fall 2001	Fall 2002
Tenure Track FTE	3.5	3.5	4	4	4
Overload/Supplemental FTEF	.39	.25	n.a.		.25#
Adjunct/Clinical FTEF (unpaid)					
Enrollment on-campus total*	5/69	4/67	2/68	6/70	2/74
Freshman	2/41	1/33	1/31	4/35	0/40
Sophomore	3/23	2/27	1/24	1/28	0/26
Junior	0/4	1/5	0/11	1/6	2/8
Senior	0/1	0/2	0/2	0/1	0/0
Masters					
Doctoral					
Pre-Professional Students					
Enrollment off-campus*	0	0	0	0	0
Traverse City					
Grand Rapids					
Southwest					
Southeast					

*Use official count (7-day)
#2002-03 annual overload.
If there has been a change in enrollment, explain why:

Capacity:
Estimate program capacity considering current number of faculty, laboratory capacity, current equipment, and current levels of S&E.

86 students

What factors limit program capacity?

Faculty and classroom/lab capacity limit the number of students who can be enrolled.

Financial

Expenditures*	FY 98	FY 99	FY 00	FY 01	FY 02
Supply & Expense	$ 9,067	$ 12,714	$ 17,228	$ 32,311	$ 16,231
Faculty Prof. Development				$ 969	
General Fund				$ 969	$ 898
Non-General Fund					$ 3,820
UCEL Incentives					
FSU-GR Incentives					
Equipment			$2,112	$ 23,727	$ 2,162
Voc. Ed. Funds	$ 17,662	n.a.			
General Fund	0	0	$ 2,112	$ 727	$ 2,162
Non-General Fund	$ 1,740	0		$ 23,000	
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 98	FY 99	FY 00	FY 01	FY 02
Net Clinic Revenue	n.a.	n.a.	n.a.	0	0
Scholarship Donations	n.a.	n.a.	n.a.	0	0
Gifts, Grants, & Cash Donations	$ 250	$ 500	$ 2,300	$ 5,250	$ 14, 050
Endowment Earnings	n.a.	n.a.	n.a.		
Institute Programs/Services					
In-Kind	n.a.	n.a.			

Other

	AY 97/98	AY 98/99	AY 99/00	AY 00/01	AY 01/02
Number of Graduates* - Total	27	25	18	20	22
- On campus	27	25	18	20	22
- Off campus					
Placement of Graduates	100%	100%	100%	100%	100%
Average Starting Salary	n.a.	27,000	n.a.	n.a.	n.a.
Productivity - Academic Year Average	312.08	302.73	266.35	231.14**	302.31**
- Summer					
Summer Enrollment					

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

**ETEC courses are shared between CDTD, MECH, & PDET faculty. Productivity for ETEC was 601.26 for 00/01, 458.52 for 01/02.

1. a) Areas of Strength:
   - Dynamic design technology field.
   - No other known Tool Design programs offered.
   - Advanced CAD application and parametric solid modeling.
   - High industrial demand and need.
   - Specific training in mold design, die design, tool design, and specialized analysis software.
   - Excellent feeder for B.S. programs.

   b) Areas of Concern and Proposed Action to Address Them:
   - Lack of faculty development funds (establish a budget for faculty development).
   - Maintaining current technology on a timely rotating basis (establish a budget and schedule for technology upgrades)
   - Place the ETEC 140 class under the control of the Tool Design program, and provide advanced solids related classes (provides for consistent content and quality of delivery, enrollment and FTEs indicate the need for a faculty position).
   - Upgrade the remaining labs to reflect a current industrial work environment (create a grant for new furnishings and a quality work space).

2. Future goals (please give time frame)

- Add a full time ETEC 140 faculty position and place it within the Tool Design program.
- Review the tool design curriculum and evaluate its content, delivery, and equipment.
- Create an advanced CAD solid modeling and parametric related class. We need a ETEC faculty member.
- Enhance the Rapid Prototyping Center and Measurements Area for advanced CAD applications.
- Increase the enrollment by 10 students in the Tool Design program.

3. Other Recommendations:
   - Support technical resources and grant proposal.
   - Make a five-year plan for faculty development and equipment acquisitions.
   - Establish a faculty development budget.
   - Support the addition of a full time ETEC 140 position within the Tool Design program.

4. Does the program have an advisory committee?

   a) If yes, when did it last meet?

      Yes, the committee met in Spring 2002.

   b) If no, why not? By what other means do faculty receive advice from employers and outside professionals?

   c) When were new members last appointed?

      Unknown.

   d) What is the composition of the committee (how many alumni, workplace representatives, academic representatives)?

      Alumni: 7
      Workplace: 6
      Academic: 0

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

      n.a.

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

   No.

   a) If yes, is the internship required or recommended?

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

      The program is a 2-year degree.

   c) How many internships take place per year? What percentage of majors has internships?

      Not required in program,

6. Does the program offer courses through the web?

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

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

CDTD 221 Mold Design uses WEB CT for quizzes and student evaluation.

CDTD 150 Blueprint Reading and Analysis uses WEB-CT in a similar way.

7. What is unique about this program?

a) For what distinctive characteristics is it known, or should be know, in the state or nation?

Only 2-year program in Michigan with such a strong emphasis on tool design.

b) What are some strategies that could lead to (greater) recognition?

Establishment of an advanced rapid-prototyping and rapid tooling center along with marketing the program on the Internet and in national publications. The Tool Design program is unique to other Colleges and Universities. Create a one of a kind B.S. degree in Tool Engineering.

8. Is the program accredited? By whom? If not, why? When is the next review?

Not accredited. Cost and questionable value to the program.

9. What have been some major achievements by students and/or graduates of the program? By faculty in the program?

A substantial number of students go to work in their field upon graduation. Approximately 60% continue their education at FSU into B.S. Engineering Technology programs including Product Design, Plastics, and Manufacturing.

Faculty stay on top of their field and are actively involved in FSU outreach activities including establishing their Rapid Prototyping Center, a CAD camp for high school students, high school/career center visits, and Project Lead The Way. They have made presentations on their outreach through rapid prototyping at state and national conferences.

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?

Exit interviews.
Portfolios with drawings and designs presented in a professional manner.
Resume
Examinations

b) What assessment measures are used, both direct and indirect?

Evaluation of the above by faculty.

c) What are the standards for assessment results?

Faculty compare student work with what would be expected in industry – based on their experiences.

d) What were the assessment results for 2001-02?

The results showed satisfactory overall understanding of expectations. Faculty thus received feedback to use for subsequent classes.

e) How will / how have the results been used for pedagogical or curricular change?

Faculty re-evaluate outcomes for each course at the end of each semester. Information is used to redirect the course the next time that it is taught.

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?

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

Yes. In the department office.

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

Form Completed by Chuck Drake, Chair, Mechanical Design Dept.
Name and Title

Reviewed by Dean_____
Name and Date

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
MECHANICAL DESIGN DEPARTMENT

PERSONNEL PROFILES
CAD Drafting/Tool Design

Rick Eldridge (231) 591-2957	Associate Professor, CAD Drafting/Tool Design MS Occupational Education, Ferris State University BS, University of Northern Colorado AAS Drafting, Kellogg Community College Senior member SME Certified Geometric Dimensioning and Tolerance Technologist Level ASMEY14.5M-1994 10 years experience automotive seat and seat recliner design Areas of expertise: Drafting, CAD, GD&T, descriptive geometry, jigs, fixtures, gaging, ASME Y14.5M-1994 Dimensioning and Tolerancing National Standards, rapid prototyping
Mark Hill (231) 591-2514	Professor, CAD Drafting/Tool Design MS Occupational Education, Ferris State University BS Trade Technical Teacher Education, Ferris State University Vocational Drafting Certification, State of Michigan Master examiner, MOCAC Areas of expertise: 3D-CAD, surfacing, CAD systems, administration, stereolithography, drafting, tool design
Todd N. Rose (231) 591-2958	Associate Professor, CAD Drafting/Tool Design MS Industrial Management, Western Michigan University BS Trade Technical Teacher Education, Ferris State University AAS Technical Drafting/Tool Design, Ferris State University Society of Manufacturing Engineers 20 years engineering experience Areas of expertise: technical drafting, descriptive geometry, CAD, tool design, GD&T, manufacturing engineering, product design, metal stamping and die design
Dan Wanink (231) 591-5021	Assistant Professor, CAD Drafting/Tool Design AAS, Ferris State University BS, Ferris State University Rapid Prototyping??? Areas of expertise:

Chuck Matrosic	Interim Dean
Randy Stein	Department Chair
Sue Martin	Department Secretary

Direct inquiries to:	CAD Drafting/Tool Design Ferris State University College of Technology 915 Campus Drive, Swan 405 Big Rapids, MI 49307-2291
Phone: FAX:	(231) 591-2755 (231) 591-2271

The following is an example of a hypothetical program at Ferris:

Ferris State University

Degreee Program Costing 2000 - 2001 (Summer, Fall, and Winter)

College: A
Department: ABC

Program Name: WEB Master Certificate

Program Credits Required (Total credits to graduate) 18

Instructor Cost per Student Credit Hour(SCH) (average for program)	$142.28
Department Cost per Student Credit Hour	$41.33
Dean's Cost per Student Credit Hour	$13.61
Total Cost per Student Credit Hour (Average for program)	**$197.22**
Total Program Instructor Cost (Assumes a student will complete program in one year)	$2,561.00
Total Program Department Cost	$744.00
Total Program Dean's Cost	$245.00
Total Program Cost (Assumes a student will complete program in one year)	**$3,550.00**

Course ID	Level	Instructor Cost	Dept Cost	Dean's Cost	SCH's Produced	Instructor Cost/SCH	Dept Cost/SCH	Deans Cost/SCH	Credits Required	Program Instructor Cost	Program Dept Cost	Program Dean's Cost
WEBM101	L	$205,544	$124,657	$36,474	2565	$80	$49	$14	3	$240	$146	$43
WEBM301	U	$22,453	$7,436	$2,176	153	$147	$49	$14	3	$440	$146	$43
WEBM501	G	$54,152	$8,165	$2,389	168	$322	$49	$14	3	$967	$146	$43
FREEELE	E	$1,423,036	$449,669	$160,912	17382	$82	$26	$9	6	$491	$155	$56
LITR287	N	$10,841,552	$3,857,577	$1,547,475	76848	$141	$50	$20	3	$423	$151	$60

Program Credits Required: This number is the total of all the *Credits Required* for a program.

Instructor Cost Per SCH: This number is the result of dividing *Total Program Instructor Cost by Program Credits Required.*

Department Cost Per SCH: This number is the result of dividing *Total Program Department Cost by Program Credits Required.*

Dean's Cost Per SCH: This number is the result of dividing *Total Program Dean's Cost by Program Credits Required.*

Total Cost per Student Credit Hour: This number is the sum of *Cost per Student Credit Hour (Instructor, Dept and Dean's).*

Total Program Instructor Cost: This number is the sum of all the *Program Instructor Costs.*

Total Program Department Cost: This number is the sum of all the *Program Dept Costs.*

Total Program Dean's Cost: This number is the sum of all the *Program Dean's Costs.*

Course ID: Each course represents all sections for that specific course.

Level: L - Lower (100 and 200 level courses); U - Upper (300 and 400 level courses); G - Graduate (500 and above level courses); E - Elective courses; N - Course not offered during the year.

Instructor Cost: The instructor costs for L, U, and G are explained on the previous pages. The teaching costs for E are explained in Appendix A. The teaching costs for N are explained in Appendix B.

Dept Cost: The dept costs for L, U, and G are explained on the previous pages. The teaching costs for E are explained in Appendix A. The teaching costs for N are explained in Appendix B.

Dean's Cost: The teaching costs for L, U, and G are explained on the previous pages. The teaching costs for E are explained in Appendix A. The teaching costs for N are explained in Appendix B.

SCH's Produced: These numbers represent the total number of student credit hours produced for a specific course (summer, fall and winter).

Instructor Cost/SCH: These numbers are a result of dividing *Instructor Cost* by *SCH's Produced* for a specific course.

Dept Cost/SCH: These numbers are a result of dividing *Dept Cost* by *SCH's Produced* for a specific course.

Dean's Cost/SCH: These numbers are a result of dividing *Dean's Cost* by *SCH's Produced* for a specific course.

Credits Required: These numbers are the total number of credits needed by a student for a specific course. These are the credits required to graduate, listed on the program checksheet.

Program Instructor Cost: These numbers are a result of multiplying the *Instructor Cost/SCH* by the *Credits Required.*

Program Dept Cost: These numbers are a result of multiplying the *Dept Cost/SCH* by the *Credits Required.*

Program Dean's Cost: These numbers are a result of multiplying the *Dean's Cost/SCH* by the *Credits Required.*

In the graph section of the report please note that the average Instructor, Dept and Dean's Cost/SCH are averages for all of the courses needed to complete a degree within the particular Colleges (graphs 2-10) and Departments (graphs 3-37). This includes average Dept and Dean's Costs from *other* departments and colleges i.e. the Dept and Dean's Cost for ENGL and MATH are included in the costing of a program in the College of Business. The *unique* Average Department and Dean's Cost per SCH for colleges and departments can be found in Tables IX and X of the report.

See Appendix A for the costing of elective courses within a program. See appendix B for the costing of courses not yet offered.

Table IV

Degree Program Costing
Instructor Cost Per SCH Ranked High to Low
2000-01

Program Name	Program Credits Required	Total Instructor Cost*	Instructor Cost Per SCH
Optometry OD (Professional Yrs 1,2,3 & 4)	163	$60,252.41	**$369.65**
Environmental Hlth & Safety Mgmt (Haz Material Mgmt opt) BS	124	$40,625.77	**$327.63**
Environmental Hlth & Safety Mgmt (Indust Safety option) BS	124	$39,400.79	**$317.75**
Medical Laboratory Technology AAS	69	$21,365.66	**$309.65**
Environmental Hlth & Safety Mgmt (Indust Hygiene option) BS	124	$37,856.48	**$305.29**
Info Systems Mgmt/Quality Improvement Emphasis MS	31	$8,444.37	**$272.40**
Environmental Health & Safety Mgmt (Env Health option) BS	131	$34,328.24	**$262.05**
Criminal Justice Administration MS	30	$7,842.89	**$261.43**
Biotechnology BS	130	$33,471.23	**$257.47**
Pharmacy BS (Professional Yrs 1,2 & 3)	94	$23,062.25	**$246.66**
Printing & Digital Graphic Imaging Technology AAS	63	$14,802.29	**$234.96**
Public Relations Certificate	13	$3,033.35	**$233.33**
Automotive Service Technology AAS	68	$15,816.44	**$232.59**
Insurance Certificate	12	$2,713.21	**$226.10**
Hotel Management BS (Yrs 3 & 4)	63	$13,598.62	**$215.85**
Restaurant and Food Industry Management AAS	69	$14,841.95	**$215.10**
Hotel Management Certificate	12	$2,557.49	**$213.12**
Info Systems Mgmt/Information Systems Emphasis MS	31	$6,562.86	**$211.71**
Mainframe Computer Certificate	13	$2,701.29	**$207.79**
Doctor of Pharmacy Pharm.D. (Professional Yrs 1,2,3 & 4)	149	$30,820.63	**$207.55**
Heavy Equipment Technology AAS	67	$13,442.49	**$200.63**
Advertising Certificate	14	$2,794.11	**$199.58**
Medical Technology (Career Mobility) BS (Yrs 3 & 4)	72	$13,774.27	**$191.31**
Nursing AAS	72	$13,469.31	**$187.07**
AS/400 Programming Certificate	12	$2,154.66	**$179.55**
HVACR Technology AAS	67	$11,911.47	**$177.78**
Opticianry AAS	65	$11,489.89	**$176.77**
International Business Certificate	12	$2,113.14	**$176.09**
Industrial Electronics Technology AAS	67	$11,740.94	**$175.24**
Automotive Service Technology (Ford ASSET opt) AAS	67	$11,707.22	**$174.73**
CAD Drafting and Tool Design AAS	67	$11,671.97	**$174.21**
Respiratory Care AAS	79	$13,693.05	**$173.33**
Automotive Service Technology (Chrysler Apprentice opt) AAS	68	$11,643.80	**$171.23**

* Instructor Cost - ***Salary & Fringe***

Source: Office of Institutional Research, g:\...\progcost\0001\icrank.rsl

Ferris State University
Degree Program Costing 2000 - 2001 (Summer, Fall, and Winter)

College : Technology
Department : Design, Manufacturing & Graphic Arts

Program Name: CAD Drafting and Tool Design AAS

Program Credits Required (Total credits to graduate) 67

*Instructor Cost per Student Credit Hour(SCH) (Average for program)	$174.21
**Department Cost per Student Credit Hour	$66.66
***Dean's Cost per Student Credit Hour	$20.81
Total Cost per Student Credit Hour (Average for program)	**$261.68**
Total Program Instructor Cost (Assumes a student will complete program in one year)	$11,671.97
Total Program Department Cost	$4,466.22
Total Program Dean's Cost	$1,394.49
Total Program Cost (Assumes a student will complete program in one year)	**$17,532.69**

Course ID	Level	Instructor Cost	Dept Cost	Dean's Cost	SCH's Produced	Instructor Cost/SCH	Dept Cost/SCH	Dean's Cost/SCH	Credits Required	Program Instructor Cost	Program Dept Cost	Program Dean's Cost
CDTD111	L	$30,636	$23,122	$5,403	222	$138	$104	$24	6	$828	$625	$146
CDTD112	L	$19,260	$9,374	$2,190	90	$214	$104	$24	3	$642	$312	$73
CDTD121	N	$10,739,143	$3,370,936	$1,862,252	75466	$142	$45	$25	6	$854	$268	$148
CDTD122	L	$26,713	$10,311	$2,410	99	$270	$104	$24	3	$809	$312	$73
CDTD211	L	$45,548	$15,623	$3,651	150	$304	$104	$24	6	$1,822	$625	$146
CDTD212	L	$21,539	$8,436	$1,971	81	$266	$104	$24	3	$798	$312	$73
CDTD221	L	$58,488	$16,248	$3,797	156	$375	$104	$24	6	$2,250	$625	$146
CDTD222	L	$20,058	$8,124	$1,898	78	$257	$104	$24	3	$771	$312	$73
COMM121	L	$215,073	$47,383	$44,776	3219	$67	$15	$14	3	$200	$44	$42
CULTELE	E	$1,709,820	$289,517	$261,225	18573	$92	$16	$14	3	$276	$47	$42
ENGL150	L	$573,937	$101,166	$100,025	7191	$80	$14	$14	3	$239	$42	$42
ENGL250	L	$443,106	$62,337	$61,634	4431	$100	$14	$14	3	$300	$42	$42
MATH116	L	$161,628	$15,987	$26,540	1908	$85	$8	$14	4	$339	$34	$56
MATL240	L	$55,401	$49,994	$11,683	480	$115	$104	$24	4	$462	$417	$97
MFGT150	L	$44,899	$34,579	$8,081	332	$135	$104	$24	2	$270	$208	$49
MFGT252	N	$10,739,143	$3,370,936	$1,862,252	75466	$142	$45	$25	2	$285	$89	$49
PHYS211	L	$114,821	$35,135	$20,420	1468	$78	$24	$14	4	$313	$96	$56
SOCAELE	E	$1,465,079	$375,755	$289,735	20589	$71	$18	$14	3	$213	$55	$42

* Instructor Cost - ***Salary & Fringe*** - the actual cost to teach a course
** Depatment Cost - ***Departmental Level Non Instructor Compensation, Supplies and Equipment*** - departmental average applied to all course prefixes within a department
*** Dean's Cost - ***Dean's Level Non Instructor Compensation, Supplies and Equipment*** - college average applied to all course prefixes within a college

FERRIS STATE UNIVERSITY

Student Credit Hours (SCH), Full Time Equated Faculty (FTEF) and SCH/FTEF Aggregated by Course Prefix within College and Department

		Student Credit Hours				Full Time Equated Faculty				SCH/FTEF			
Prefix	Year	Summer	Fall	Winter	F + W (a)	Summer	Fall	Winter	Avg F + W (b)	Summer	Fall	Winter	F + W (a / b)
College of Technology													
Design, Manufacturing & Graphic Arts													
PDET	2000-01	0.00	261.00	0.00	261.00	0.00	0.82	0.00	0.41		318.88		637.76
PHOT	1998-99	0.00	42.00	120.00	162.00	0.00	0.33	0.55	0.44		126.00	220.00	368.69
PHOT	1999-00	0.00	114.00	186.00	300.00	0.00	0.55	0.75	0.65		209.00	248.00	463.16
PHOT	2000-01	51.00	132.00	0.00	132.00	0.25	0.55	0.00	0.27	204.00	242.00		484.00
PLTS	1997-98	415.00	1,077.00	1,149.00	2,226.00	3.29	7.50	7.44	7.47	126.14	143.60	154.44	297.99
PLTS	1998-99	396.00	891.00	1,050.00	1,941.00	2.62	7.45	7.11	7.28	151.15	119.60	147.68	266.62
PLTS	1999-00	436.00	938.00	1,153.00	2,091.00	3.31	6.58	7.20	6.89	131.72	142.66	160.03	303.48
PLTS	2000-01	340.00	1,176.00	0.00	1,176.00	2.21	7.00	0.00	3.50	153.85	168.00		336.00
PMGT	1997-98	76.00	235.00	166.00	401.00	0.67	1.67	2.00	1.83	113.43	141.00	83.00	218.73
PMGT	1998-99	62.00	227.00	211.00	438.00	0.67	1.00	1.00	1.00	92.54	227.00	211.00	438.00
PMGT	1999-00	82.00	202.00	237.00	439.00	0.67	2.00	1.67	1.83	122.39	101.00	142.20	239.45
PMGT	2000-01	78.00	163.00	0.00	163.00	0.67	2.00	0.00	1.00	116.42	81.50		163.00
PTEC	1997-98	48.00	722.00	678.00	1,400.00	0.88	7.33	7.00	7.17	54.55	98.45	96.86	195.35
PTEC	1998-99	0.00	873.00	660.00	1,533.00	0.00	6.53	6.45	6.49		133.76	102.25	236.19
PTEC	1999-00	0.00	868.00	785.00	1,653.00	0.00	6.45	6.91	6.68		134.48	113.55	247.31
PTEC	2000-01	0.00	821.00	0.00	821.00	0.00	6.12	0.00	3.06		134.12		268.25
RUBR	1998-99	0.00	72.00	42.00	114.00	0.00	0.25	1.00	0.63		288.00	42.00	182.40
RUBR	1999-00	36.00	159.00	108.00	267.00	0.67	1.80	1.38	1.59	53.73	88.33	78.55	168.19
RUBR	2000-01	68.00	288.00	0.00	288.00	0.67	2.00	0.00	1.00	101.49	144.00		288.00
TDTD	1997-98	0.00	671.00	543.00	1,214.00	0.00	3.78	4.00	3.89		177.51	135.75	312.08

FERRIS STATE UNIVERSITY

Student Credit Hours (SCH), Full Time Equated Faculty (FTEF) and SCH/FTEF Aggregated by Course Prefix within College and Department

		Student Credit Hours				Full Time Equated Faculty				SCH/FTEF			
Prefix	Year	Summer	Fall	Winter	F + W (a)	Summer	Fall	Winter	Avg F + W (b)	Summer	Fall	Winter	F + W (a / b)
College of Technology													
Heavy Equipment													
HEQT	2000-01	0.00	0.00	842.00	842.00	0.00	0.00	5.66	2.83			148.85	297.70
HEQT	2001-02	0.00	804.00	754.00	1,558.00	0.00	5.77	5.70	5.74		139.32	132.27	271.63
HSET	2000-01	0.00	0.00	156.00	156.00	0.00	0.00	1.33	0.67			117.00	234.00
HSET	2001-02	56.00	212.00	236.00	448.00	0.67	1.40	0.97	1.18	83.58	151.54	243.38	378.27
Manufacturing Engineering Technology													
MATL	2000-01	0.00	0.00	234.00	234.00	0.00	0.00	0.86	0.43			272.09	544.19
MATL	2001-02	0.00	484.00	236.00	720.00	0.00	1.61	0.83	1.22		300.73	284.34	590.31
MFGE	2000-01	0.00	0.00	1,171.00	1,171.00	0.00	0.00	6.39	3.19			183.26	366.51
MFGE	2001-02	162.00	1,327.00	1,160.00	2,487.00	1.06	4.80	5.89	5.35	152.83	276.23	196.94	465.12
MFGT	2000-01	0.00	0.00	636.00	636.00	0.00	0.00	5.61	2.80			113.37	226.74
MFGT	2001-02	0.00	775.00	702.00	1,477.00	0.00	5.78	6.06	5.92		134.16	115.84	249.56
Mechanical Design													
CDTD	2000-01	0.00	0.00	527.00	527.00	0.00	0.00	4.56	2.28			115.57	231.14
CDTD	2001-02	0.00	699.00	546.00	1,245.00	0.00	3.90	4.34	4.12		179.38	125.81	302.31
ETEC	2000-01	0.00	0.00	204.00	204.00	0.00	0.00	0.68	0.34			300.63	601.26
ETEC	2001-02	0.00	312.00	129.00	441.00	0.00	1.48	0.44	0.96		210.77	290.98	458.52
MECH	2000-01	0.00	0.00	588.00	588.00	0.00	0.00	3.38	1.69			174.18	348.36
MECH	2001-02	0.00	741.00	767.00	1,508.00	0.00	3.20	3.34	3.27		231.78	229.50	461.23

FERRIS STATE UNIVERSITY

Student Credit Hours (SCH), Full Time Equated Faculty (FTEF) and SCH/FTEF Aggregated by Course Prefix within College and Department

Prefix	Year	Student Credit Hours				Full Time Equated Faculty				SCH/FTEF			
		Summer	Fall	Winter	F + W (a)	Summer	Fall	Winter	Avg F + W (b)	Summer	Fall	Winter	F + W (a / b)
College of Technology													
Design, Manufacturing & Graphic Arts													
TDTD	1998-99	0.00	726.00	561.00	1,287.00	0.00	4.28	4.22	4.25		169.63	132.85	302.73
TDTD	1999-00	0.00	619.00	513.00	1,132.00	0.00	3.75	4.75	4.25		165.07	108.00	266.35
WELD	1997-98	134.00	802.00	583.00	1,385.00	0.84	5.00	5.00	5.00	159.52	160.40	116.60	277.00
WELD	1998-99	76.00	915.00	722.00	1,637.00	0.67	5.08	5.23	5.16	113.43	180.12	138.05	317.56
WELD	1999-00	114.00	1,013.00	731.00	1,744.00	0.67	5.00	5.00	5.00	170.15	202.60	146.20	348.80
WELD	2000-01	88.00	1,104.00	0.00	1,104.00	0.67	5.00	0.00	2.50	131.34	220.80		441.60
Electronics/CNS													
ECNS	2000-01	0.00	0.00	114.00	114.00	0.00	0.00	1.73	0.87			65.77	131.54
ECNS	2001-02	0.00	330.00	122.00	452.00	0.00	2.01	1.35	1.68		164.02	90.42	268.96
EEET	2000-01	0.00	0.00	1,351.00	1,351.00	0.00	0.00	8.88	4.44			152.20	304.39
EEET	2001-02	86.00	1,326.00	1,427.00	2,753.00	0.67	7.99	9.25	8.62	128.36	166.00	154.21	319.34
HVACR													
HVAC	2000-01	0.00	0.00	1,168.00	1,168.00	0.00	0.00	7.70	3.85			151.69	303.38
HVAC	2001-02	102.00	1,353.00	1,174.00	2,527.00	0.67	6.75	7.82	7.28	152.24	200.44	150.18	346.94
Heavy Equipment													
HEQK	2000-01	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00				
HEQK	2001-02	60.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	89.55			

Table I

Degree Program Costing Summary
Alpha Listing of Programs
2000-01

Program Name	Prog Crs Req	Total Instructor Cost*	Total Dept Cost**	Total Dean's Cost***	Total Program Cost	Instructor Cost Per SCH	Dept Cost Per SCH	Dean's Cost Per SCH	Total Cost Per SCH
Accountancy AAS	60	$6,656.29	$1,200.92	$932.51	$8,789.72	$110.94	$20.02	$15.54	$146.50
Accountancy (Cost/Managerial Track) BS	124	$17,083.36	$2,806.49	$2,107.84	$21,997.69	$137.77	$22.63	$17.00	$177.40
Accountancy (Professionally Directed Track) BS	124	$16,808.47	$2,498.18	$2,038.96	$21,345.62	$135.55	$20.15	$16.44	$172.14
Accountancy (Public Accounting Track) BS	124	$17,234.74	$2,434.47	$2,026.95	$21,696.16	$138.99	$19.63	$16.35	$174.97
Accountancy/Computer Information Systems BS	139	$20,122.15	$3,167.41	$2,063.02	$25,352.58	$144.76	$22.79	$14.84	$182.39
Accountancy/Finance BS	137	$20,064.21	$2,433.40	$2,061.14	$24,558.75	$146.45	$17.76	$15.04	$179.26
Advanced Construction Management Certificate	12	$1,491.76	$791.89	$294.09	$2,577.74	$124.31	$65.99	$24.51	$214.81
Advanced Studies in Global Logistics Certificate	12	$1,432.59	$394.94	$177.87	$2,005.40	$119.38	$32.91	$14.82	$167.12
Advanced Studies in Investment Analysis Certif	12	$1,919.49	$218.97	$177.87	$2,316.34	$159.96	$18.25	$14.82	$193.03
Advertising BS	125	$13,796.25	$3,315.92	$1,906.85	$19,019.02	$110.37	$26.53	$15.25	$152.15
Advertising Certificate	14	$2,794.11	$529.20	$207.52	$3,530.83	$199.58	$37.80	$14.82	$252.20
Allied Health Education BS (Yrs 3 & 4)	100	$10,674.60	$4,724.19	$2,391.07	$17,789.86	$106.75	$47.24	$23.91	$177.90
Applied Biology BS	127	$13,620.31	$3,093.38	$1,875.95	$18,589.64	$107.25	$24.36	$14.77	$146.38
Applied Biology (Environmental Biology Track)	127	$15,084.76	$3,243.31	$1,885.21	$20,213.29	$118.78	$25.54	$14.84	$159.16
Applied Biology (Pre-Dentistry Track) BS	127	$14,076.66	$3,059.93	$1,846.02	$18,982.60	$110.84	$24.09	$14.54	$149.47
Applied Biology (Pre-Medicine Track) BS	127	$13,840.53	$3,040.72	$1,832.20	$18,713.44	$108.98	$23.94	$14.43	$147.35
Applied Biology (Pre-Physical Therapy Track) B	127	$13,935.52	$3,039.01	$1,842.84	$18,817.37	$109.73	$23.93	$14.51	$148.17
Applied Biology (Pre-Veterinary Medicine Track)	123	$13,051.05	$2,854.48	$1,786.36	$17,691.88	$106.11	$23.21	$14.52	$143.84
Applied Mathematics BS	120	$13,671.07	$2,938.46	$2,252.10	$18,861.63	$113.93	$24.49	$18.77	$157.18
Applied Mathematics (Actuarial Science Track)	120	$14,665.86	$2,757.68	$2,180.59	$19,604.13	$122.22	$22.98	$18.17	$163.37
Applied Mathematics (Computer Science Track)	120	$13,569.50	$3,011.04	$2,273.63	$18,854.17	$113.08	$25.09	$18.95	$157.12
Applied Mathematics (Operations Research Tra	120	$13,031.45	$2,958.44	$2,281.86	$18,271.76	$108.60	$24.65	$19.02	$152.26
Applied Mathematics (Statistics Track) BS	120	$14,635.57	$2,770.34	$2,218.11	$19,624.01	$121.96	$23.09	$18.48	$163.53
Applied Speech Communication AA	60	$5,157.59	$1,210.22	$907.86	$7,275.68	$85.96	$20.17	$15.13	$121.26
Applied Speech Communication BS	126	$14,174.94	$2,884.58	$2,168.84	$19,228.36	$112.50	$22.89	$17.21	$152.61
Architectural Technology AAS	66	$9,088.24	$3,564.74	$1,403.87	$14,056.84	$137.70	$54.01	$21.27	$212.98
AS/400 Programming Certificate	12	$2,154.66	$419.33	$177.87	$2,751.86	$179.55	$34.94	$14.82	$229.32
Athletic Coaching Certificate	10	$768.64	$448.46	$279.70	$1,496.80	$76.86	$44.85	$27.97	$149.68
Automotive and Heavy Equipment Mgt BS (Yrs	67	$8,179.10	$2,660.11	$1,305.37	$12,144.59	$122.08	$39.70	$19.48	$181.26
Automotive Body AAS	63	$8,896.84	$2,948.29	$1,375.54	$13,220.68	$141.22	$46.80	$21.83	$209.85
Automotive Service Tech (General Motors ASEP	68	$11,643.80	$3,615.19	$1,489.13	$16,748.12	$171.23	$53.16	$21.90	$246.30
Automotive Service Technology AAS	68	$15,816.44	$3,615.19	$1,489.13	$20,920.76	$232.59	$53.16	$21.90	$307.66
Automotive Service Technology (Chrysler Appre	68	$11,643.80	$3,615.19	$1,489.13	$16,748.12	$171.23	$53.16	$21.90	$246.30
Automotive Service Technology (Ford ASSET o	67	$11,707.22	$3,603.65	$1,475.22	$16,786.09	$174.73	$53.79	$22.02	$250.54
Biology Education BS	122	$12,079.52	$4,687.23	$2,344.67	$19,111.42	$99.01	$38.42	$19.22	$156.65
Biotechnology BS	130	$33,471.23	$3,177.66	$1,811.13	$38,460.02	$257.47	$24.44	$13.93	$295.85
Building Construction Technology AAS	64	$7,876.19	$3,841.21	$1,308.34	$13,025.75	$123.07	$60.02	$20.44	$203.53
Business Administration BS	123	$12,784.42	$2,588.42	$1,928.49	$17,301.33	$103.94	$21.04	$15.68	$140.66
Business Education/General Business BS	159	$18,584.46	$5,825.86	$3,226.41	$27,636.74	$116.88	$36.64	$20.29	$173.82
Business Education/Marketing/Distributive Edu	156	$18,537.74	$6,521.55	$3,230.68	$28,289.96	$118.83	$41.80	$20.71	$181.35
CAD Drafting and Tool Design AAS	67	$11,671.97	$4,466.22	$1,394.49	$17,532.69	$174.21	$66.66	$20.81	$261.68

* Instructor Cost - ***Salary & Fringe***
** Depatment Cost - ***Departmental Level Non Instructor Compensation, Supplies and Equipment***
*** Dean's Cost - ***Dean's Level Non Instructor Compensation, Supplies and Equipment***

SECTION 12

CONCLUSIONS

1. THE CDTD PROGRAM GOALS AND OBJECTIVES ARE CENTRAL TO THE FSU MISSION

   The CDTD program provides applied technical education central to the Ferris State University mission. The graduates are provided career skills in tool design. Tool design is the foundation for all manufacturing processes. Tool designers are in demand in the industrial workplace and which provides a productive and well paying career. The graduates also have the ability to transfer their skills into a Bachelors program. This provides CDTD students with a broader technical experience with the potential for career advancement.

2. THE CDTD PROGRAM IS UNIQUE AND IS WELL POSITIONED TO INCREASE ITS VISIBILITY

   The CDTD program title is unique with no other program title found in other universities. The program provides students with the opportunity to transfer into a number of Bachelors programs. With the program being in existence for over fifty years its quality and reputation is well known throughout the state. With the program presenting at state and national conferences the program has also gained a national exposure and reputation.

3. THE CDTD PROGRAM PROVIDES IMPORTANT SERVICES TO THE STATE AND THE NATION

   The CDTD graduate provides services in tool design and the manufacturing sector on both the state and national level. With tool design being the foundation for all manufacturing process, graduates with tool design skills are highly sought after. Our graduate follow-up survey and employer survey pay tribute to the quality and reputation of the CDTD program.

4. THE CDTD PROGRAM IS IN DEMAND BY STUDENTS

   CDTD program enrollment remains high and consistent. The CDTD program currently has 48 freshman enrolled for fall 2003. With a quality CAD and tool design program students are attracted to the curriculum. With the addition of a new tool design computer lab, RPC facilities and inspection equipment, the program has gained wider exposure. The skills and knowledge student gains are in high demand in industry.

5. THE CDTD QUALITY OF INSTRUCTION IS EXCELLENT

   CDTD students and graduates are very satisfied with the quality of education provided by the program. The entire faculty has industrial experience and continue to update their knowledge by attending conferences and training seminars. Based on industry, alumni and current student surveys, the curriculum content meet the needs of industry and continually evaluated and improved. The excellent careers and career responsibilities, as indicated by the graduate follow-up survey, is a testimonial of the quality and success that the CDTD

graduate has obtained. The jobs and salaries graduates have obtained indicate the students are well prepared to enter the workplace.

6. THE CDTD PRGRAM GRADUATES ARE IN DEMAND

Graduates of the CDTD program indicate that they have little difficulty in obtaining employment after graduation. Starting salaries are excellent and competitive with other associate degree programs. With additional training and degrees the graduates continue to become leaders in the design field.

7. THE CDTD PROGRAM FACILITIES NEED IMPROVEMENT AND EQUIPMENT IS MARGINAL

The CDTD program has worked to develop improved design labs and equipment. The curriculum and nature of design requires excellent equipment. With the addition of the RPC Center, inspection equipment and tool design lab, the program has taken a large step forward. It is imperative that the University financially supports and enhances this type of effort with adequate funding. Computers and software, which are critical to the success of the CAD Drafting Tool Design program, needs continual maintenance and updating. Improvement needs to be made in much of the classroom environment. This would be in the form of lighting, furniture and furnishings (carpet).

8. THE CDTD PROGRAM COST IS ACCEPTABLE

The CDTD program cost is consistent with other associate degree graphic and design programs in the College of Technology and the average FSU Associate Degree program. With a lab intensive curriculum and smaller lab sections the program maintains acceptable SCH/FTEF ratios. In addition each CDTD student provides a credit hour contribution to both the college and the university relative to the credit hours taken in program courses.

9. COLLEGE OF TECHNOLOGY AND FERRIS STATE UNVIERSITY ADMINISTRATIVE SUPPORT

The College of Technology administrative support for program funding has been marginal at best. The CDTD program has seen a slight increase in supply and equipment funding. This is largely due to the stability and increase in CDTD enrollment. The COT and FSU administration has not taken a proactive position to work with the CDTD program to establish an equipment and software initiative. It appears that a plan to cycle computers and software be should be put in place. The program wants to implement new software applications, as they become technically desirable.

SECTION 13

RECOMMENDATIONS

The Program Review Panel has carefully evaluated the results of the self-study. The APR panel members feel the following areas are the strongest aspects of the study.

Graduate Follow-up
Industry Follow-up and perceptions
Advisory Committee Perceptions of the program
Labor Market and demand for graduates
Enrollment

The weakest areas of the program were identified as

Instructional materials
Equipment
Facilities
Student Perceptions of Instruction

Based on the overall evaluation of the CAD Drafting Tool Design program by the review panel, the program continues to meet or exceed all criteria and warrants equipment and resource allocation to maintain its quality and growth. The following recommendations are made to enhance the CAD Drafting Tool Design program strength and weaknesses.

1. Instructional material:

   The CDTD program should incorporate new design software into the curriculum. The CDTD faculty have identified a source for advanced software application in all areas of design and manufacturing. Obtaining the applications will greatly enhance the marketability and skills of our students. The applications will provide the opportunity to increase the quality of student portfolios and keep the graduates at the leading edge of new technologies. Industry looks to Ferris State University to be a leader in teaching our students applied technologies. The software applications could be used by most programs in the College of Technology. Design applications would include advanced tolerancing, mold design, tool design, die design and mold simulation. To support the implementation of new software, expenditure for material and training will be needed.

The CDTD program should have projectors available for each instructional lab. With graphics and computer applications being taught in each classroom it is imperative that our students be given the best instruction and delivery methods possible. The addition of one new projector mounted from the ceiling would provide for consistent and quality delivery of information. Support for staffing a part time adult for our Rapid Prototyping Center would be beneficial. This person would be responsible for rapid prototyped orders placed from High Schools and Career Centers, equipment maintenance, material among other activities. This person would help with the development brochures and registration of students for summer RP Camp and the logistics of summer camp activities.

2. Equipment Needs:

The most important equipment related need for the program is support for maintenance and upgrade of computers, rapid prototyping equipment and measurement equipment. The program has made great improvements in lab equipment and the addition of the Rapid Prototyping Center. It is imperative that an initiative be put in place that would insure replacement and maintenance of equipment. A plan to cycle equipment into other programs and obtain new high quality equipment at the end of its life cycle period should be considered. Continued pressure to make due with what we have does not insure the student that they are getting the latest and best quality of equipment and education.

The addition of a high quality industrial plotter or laser printer would enhance the program and provide greater marketability. Student projects would be presented with a professional appearance. Photo quality prints of solid models and prototypes would greatly enhance portfolios and increase the chance for employment. Many career centers provide reproductions of student work with better quality than currently available in the CAD Drafting Tool Design program at Ferris State University. Additional expenditure for equipment would be needed to improve the printed quality of student work.

3. Facility Needs:

Carpeting and air conditioning is needed for the Rapid Prototyping Center and inspection lab as well as some classrooms. Some electrical and computer cables are on the classroom floors. This causes some safety concerns and the appearance is not acceptable. The accessibility to the fifth floor of Swan is still an inconvenience. Signage for program departments and classrooms should be provided. Visitors and students find it difficult to locate facilities and offices.

4. Curriculum:

The program should investigate the possibility of offering a minor in CAD design and applications. The College of Technology offers a three credit Fundamental drawing and CAD class. The class does not allow enough time for advanced CAD solid modeling with applications. With today's computer applications and the need for industry to have highly trained computer specialists, it would benefit the CDTD program to explore the advantages and disadvantages of a CAD minor. The faculty will continue to evaluate curriculum with input from industry the advisory board and student reactions. Course content continues to change with new software enhancements and technical improvements.

5. Recruiting:

The CAD Drafting Tool Design program continually strives to improve enrollment and recruiting methods. The creation of summer camps has provided more exposure for the College of Technology. Now the program would like to provide solid modeling competition for high schools and career centers. This activity could also include seminars for high school faculty attending with their students. Additional funding for recruiting and special activities would benefit the recruiting efforts, summer camps, solid modeling competition and HS teacher training activities.

5. Support Staff

The existing office staffing does not work well with the current Mechanical Design Department structure. The combination of seven degrees with two departments and one secretary makes it almost impossible to provide the support everyone needs. Faculty are taking on more secretarial activities since the last restructuring of the COT. The College of Technology needs to evaluate the staff loads and organization for efficiency. We believe an evaluation of other programs and staff loads would reveal significant differences.

The Mechanical Design Department office lacks a professional appearance. The first impression of the office area is disappointing. Prospective students and parents have a difficult time finding the office. We would like to see part of the first floor of Swan made into a large greeting area with departmental offices located in one area. This could provide a pool of secretaries with specified tasks and duties. This would provide a friendlier, efficient and appealing first impression for prospective students.

APPENDIX A

Section 1 – Overview of Program

Supporting Information

Curriculum Check Sheet
Academic Program Review Schedules
Academic Program Review Cost sheet

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

CAD DRAFTING AND TOOL DESIGN
ASSOCIATE IN APPLIED SCIENCE DEGREE
FALL SEMESTER
Curriculum Guide Sheet

NAME OF STUDENT _____ STUDENT I.D. _____

Total semester hours required for graduation: 66

NOTE: Meeting the requirements for graduation indicated on this sheet is the responsibility of the student. The student is also responsible for meeting all SU General Education requirements as outlined in the university catalog. Your advisor is available to assist you.

			CREDITS/GRADE
FIRST YEAR - FALL SEMESTER			
CDTD	111	Drafting Fundamentals (admitted to CDTD; CDTD 112 co req)	4 _____
CDTD	112	Fundamentals of CAD (admitted to CDTD; CDTD 111 co req)	4 _____
ENGL	150	English 1	3 _____
MATH	116	Intermediate Algebra and Numerical Trigonometry*	4 _____
FIRST YEAR - WINTER SEMESTER			
CDTD	121	Product Detailing with Advanced Tolerancing (CDTD 111, 112)	3 _____
CDTD	122	CAD Solid Modeling with Parametrics (CDTD 111, 112)	4 _____
COMM	121	Fundamentals of Public Speaking	3 _____
ENGL	250	English 2	3 _____
CDTD	130	Tool Detailing (CDTD 111, 112)	2 _____
MFGT	150	Manufacturing Process 1	2 _____
SECOND YEAR - FALL SEMESTER			
CDTD	211	Die Design (CDTD 121, 122; CDTD 130 recommended)	6 _____
CDTD	212	Computer Aided Tool Design (CDTD 121, 122; CDTD 130 recommended)	3 _____
MATL	240	Introduction to Material Science	4 _____
PHYS	211	Introductory Physics 1	4 _____
SECOND YEAR - WINTER SEMESTER			
CDTD	221	Mold Design (CDTD 121, 122; CDTD 130 recommended)	6 _____
CDTD	222	Computer Aided Engineering (CDTD 121, 122; CDTD 130 recommended)	3 _____
MFGT	252	Advanced Machine Tools	2 _____
____	____	Cultural Enrichment Elective	3 _____
____	____	Social Awareness Elective	3 _____

NOTE: Students planning on entering a four-year technology degree program must take MATH 116 and MATH 126 sequence to meet entrance requirements where MATH 216 is called for.

Academic Program Review
Evaluation Plan
CAD Drafting Tool Design Technology

Degree Awarded: A.A.S. CAD Drafting Tool Design Technology

Program Review Panel:

Co-Chairs: Rick Eldridge and Todd Rose
Program Faculty: Mark Hill, Dan Wanink
Individual with special interest in the Program: Tom Crandell
Faculty outside the College of Technology: Clyde Hardman
Department Chair: Chuck Drake

Purpose: to conduct a study of the CAD Drafting Tool Design Technology Program and its needs, effectiveness and mission so the University can make informed decisions about the resources and resource allocations.

Data Collection Techniques:

Comparative analysis of current and past years data:

1. 2003 Graduate surveys and most recent APR survey data
2. 2003 Employer surveys and most recent APR survey data
3. 2003 Student evaluation of program and courses and most recent APR data.
4. 2003 Faculty perceptions of the program by CAD Drafting Tool Design faculty and College of Technology faculty.
5. 2003 Advisory Committee perceptions of the program from the survey and most recent APR survey results.
6. Labor Market analysis information from current market indicators.
7. Evaluation of facilities and equipment as review by faculty and industry requirements and needs.
8. Curriculum evaluation information will be taken from industry requirements and standards. Data from employer and advisory surveys will be included.

Schedule of Events:

Activity	Leader	Target Date
Graduate survey	Hill	March 1, 2003
Employer survey	Rose	March 1, 2003
Student Survey	Wanink	March 1, 2003
Faculty Perceptions of Program	Hill	March 1, 2003
Advisory Committee Perceptions	Wanink	March 1, 2003
Labor Market Analysis	Eldridge	March 1, 2003
Evaluation of Facilities	Rose	March 1, 2003
Curriculum Evaluation	Wanink, Eldridge	April 1, 2003

Data Collection Activities

Mark Hill:

Graduate follow-up survey: The purpose of this activity 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 program in terms of job placement and preparedness of the graduate for the marketplace. A mailed questionnaire is most preferred; however, under certain conditions telephone or personal interviews can be used to gather the data.

Todd Rose:

Employer follow-up survey: 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.

Dan Wanink:

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.

Mark Hill:

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.

Dan Wanink:

Advisory committee perceptions: 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 megatrends that might affect job placement (both positively and adversely), and other relevant information. Recommendations for improvement must be sought from this group. In the event that a program does not have an advisory committee, a group of individuals may be identified to serve in that capacity on a temporary basis.

Rick Eldridge

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.

Todd Rose:

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.

Dan Wanink and Rick Eldridge

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.

CAD Drafting Tool Design Technology
Academic Program Review
Proposed Budget

Student Surveys:

Copying costs:	$65.00
Mailing costs:	$100.00
Return Envelope costs:	$20.00
Return Mailing costs:	$50.00

Employer follow-up survey:

Copying costs:	$40.00
Mailing costs:	$100.00
Return Envelope costs:	$20.00
Return Mailing costs:	$30.00

Advisory Committee Surveys:

Copying Mailing and Return Mailing Costs: $20.00

Student wage support:

30 Hours @ $5.00 $150

Phone Expenses: $50.00

Final Document Coping Costs: $100.00

Total: $745

APPENDIX B

Section 2 – Graduate Follow-up Survey

Supporting Information

Graduate Follow-up Survey
Survey Comments:
Survey Section 3 Question 1
Survey Section 3 Question 2
Survey Section 3 Question 3
Survey Section 3 Question 5
Survey Section 3 Question 6

CAD DRAFTING/TOOL DESIGN
ALUMNI SURVEY

About Yourself:

What is your name and what is your employment address?

_____

_____

_____

_____

What year did you graduate from the CDTD program? _____

Did you receive a BS degree from Ferris? ☐ YES ☐ NO

If yes, what program?_____

☐ Plastics ☐ Manufacturing Engineering ☐ Product Design
☐ Business ☐ Education ☐ Other_____

Did you receive a BS degree from another university? ☐ YES ☐ NO

If yes, name of degree and university_____

What is your present job title? _____

What was your starting salary after graduation? *(Please circle one.)*

Range: $
☐ 20-30,000
☐ 30-40,000
☐ 40-50,000
☐ 50-60,000
☐ 60+

What is your present salary range?

Range: $
☐ 15-20,000
☐ 20-30,000
☐ 30-40,000
☐ 40-50,000
☐ 50-60,000
☐ 60-70,000
☐ 70-80,000
☐ 90+

Was it difficult to find a position in Drafting/Tool Design or closely related field upon graduation? ☐ YES ☐ NO

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

What do you believe was the most valuable part of your coursework and why? *(Please write in your response.)*

What do you believe was the least valuable part of your coursework and why? *(Please write in your response.)*

Please list any other course(s) that you think should be included in the program.

What year did you graduate and what did you think of the CDTD facilities at that time?

What trends in the Drafting and Tool Design industry do you see impacting the CDTD program at Ferris in the next 5 years?

Please add any general comments.

Please return by April 11, 2003

About your CAD Drafting and Tool Design education:

Based on your experiences and knowledge of the profession, to what extent did the course knowledge in the following areas prepare you for employment?

Please circle the appropriate rating.

	To a Great Extent	**Somewhat**	**Neutral**	**Very Little**	**Not at All**
Fundamentals of Drafting (board)	A	B	C	D	E
Introduction to CAD	A	B	C	D	E
Descriptive Geometry (board)	A	B	C	D	E
Product Detailing	A	B	C	D	E
CAD 3D Wireframe and Surfacing	A	B	C	D	E
CAD 3D Solids	A	B	C	D	E
Tool Design	A	B	C	D	E
Die Design	A	B	C	D	E
Mold Design	A	B	C	D	E
Basic Machine Tool Operations	A	B	C	D	E
Advanced Machine Tools w/CAM	A	B	C	D	E
Physics (general)	A	B	C	D	E
Material Science	A	B	C	D	E
Product Detailing with GDT	A	B	C	D	E
Product Assemblies	A	B	C	D	E
Moldflow/CAE	A	B	C	D	E

In thinking over your experiences at Ferris, to what extent do you feel your Associate Degree prepared you for success?

Please circle the appropriate rating.

	To a Great Extent	**Somewhat**	**Neutral**	**Very Little**	**Not at All**
Overall Technical Training	A	B	C	D	E
Gaining a Broad General Education	A	B	C	D	E
Writing Clearly and Effectively	A	B	C	D	E
Acquiring proficiency with computers	A	B	C	D	E
The ability to learn on your own, pursue ideas, and find information you need.	A	B	C	D	E
How effectively did Ferris prepare you for employment?	A	B	C	D	E
In general, how satisfied were you with your overall experience in the CDTD program?	A	B	C	D	E
Would you recommend the CAD Drafting and tool Design program to a friend or relative?	A	B	C	D	E

Section 3 Question 1

Graduate Follow-up Survey
Exact comments are as follows:

1. **What do you believe was the most valuable part of your coursework?**

- I enjoyed all my time at FSU.
- CAD Training: I use CAD software for every project.
- Tool and die design because it taught me to think through issues of design.
- The fundamentals on the board are the most valuable part of the learning experience. Without the fundamentals you cannot apply it on CAD.
- The most important thing that I learned was how to learn.
- Core classes low instructor- student ratio.
- Design classes and computer classes. Programming computer class (BASIC)
- "Hands On" realistic assignments.
- Concentration on the area of study.
- CAD (today –1962-Drafting Board Work)
- The machine tool part. Being a designer comes with a general lack of respect from die-makers and when I volunteered to go into the shop during slow times and get dirty the die-makers seemed to like it. It made then realize I wasn't just another "Design nerd"
- I believe that the hands on, get in and try it attitude was very beneficial.
- Design classes, Labs, and CAD. Machine Tool and MFG.
- Learning how our trade fit into the everyday function of the work environment. I knew that I liked to draw, but I had no idea what my everyday experience would be like. Also, I appreciated the Lab sessions; this gave us a chance to actually improve our technique.
- All of it the program was laid out very well.
- The general fundamentals are applicable in other divisions of industry; I myself never worked in auto industry but started in a garage shop die design.
- Although I didn't like it at the time descriptive geometry helped me with figuring out projection views and reading prints and drawings must.
- Real industry problems to solve. Cool work programs.
- Building a fixture I designed. To think simple. Should have paid more attention to metal selection choice.
- Manual board drafting. Learned to really visualize in 3D
- Descriptive geometry
- Real work just like the industry.
- The way the instructors made the program like real life.
- Lab time actual design activity.

- Utilizing a team approach to complete a large program.
- Machine shop.
- I enjoyed my strength with materials class. I came to FSU weak in math I stated out in a non-credit class and worked through Trig. I always appreciated that opportunity and am thankful for the dedicated staff at that time.
- Hands on assignments, Lab work
- Learning to analyze and adopt existing ideas to the present's projects before going off blindly in some other direction.
- Since I never used the vocation I have no basis no answer
- Trigonometry Jig/fixture design. understanding tolerance
- It gave me self confidence
- CAD because everything is done now on the computer.
- Die design
- The hands on in the lab 4 classes 25hrs.
- CAD is key. Especially 3D and solid modeling. Board work to me was great. It made me see what was not readily visible. Today the computer generates it for you. You still need to know.
- Learning how to use CAD because everyone uses it now.
- Tooling design, die and descriptive geometry. Machine shop class very helpful.
- Geometry related. Projection, isometrics, and perspective drawings as well as discipline geometry provided a strong base for reading drawings of parts and tooling.
- Cad Design, learning how to operate Mechanical Desktop
- Understanding of all aspects, drafting, materials, design. The related been of Benefit.
- The Drafting fundamentals (conventional board drafting) were by far and away the most useful component of my education. I had no formal drafting prior to college. These classes taught me the basics of how to visualize and put views together.
- The amount of time spent on projects to help realize what we run into out in the working environment
- Learning the basic mechanics and design of molding tools and stamping dies.
- The program was well rounded. The lab work created an opportunity to think and work on your own – This was very important. You need to make your own decisions.
- Hand on approach it is very effective when learning real life working condition at school.
- The fundamentals of tool design. It taught me what tool design was. Strength of materials. Understanding loads and stress analysis is the back bone of a good designer.
- The tool and die design class. Basic fundamental were taught on how on how to use all drafting tools and how tools and dies were constructed.

- Math and drafting basics because they are both foundational.
- Lab work 4 hours of design work 5 days a week.
- The practical application of drafting standards and design principles, from instructors who had true real world experience.
- Different instructors from quarter to quarter in design labs with different design STDs. Prepared me to be flexible and adaptive to employer needs.
- The drafting and design courses. It is good to be able to visualize a part or design without physically having it in front of you.
- Drafting and design methods along with extended math skills - (Trig) prepared me most for the jobs market of design.
- fundamentals of drafting principals, layer the groundwork for understanding how to properly apply my drafting-skills,
- Machining was also a key hands on class that I have used for person
- Learning GD & T
- Time in the lab on the tube applying technologies
- Knowledge of technical skills.
- Tech drafting, tool design 1 & 2, math classes, Mech shop classes
- Kinematics - used in machine design.
- Learning the Basic on the board!!!
- Design projects that utilized different software and operating systems. Basic and advanced drafting techniques. 3D CAD is a must!
- Learning how to learn. All math courses are extremely important. It is used daily by our engineers.
- Practical hands-on lab work for drafting and machine TODL applications. Made it possible to better understand machine build and machining practices.
- The tool design class. I was currently employed as a detailer. With what I learned in that class I was able to become a better detailer and was able to advance into design quickly.
- AutoCAD/CAD training along with Diacritic geometry.
- Practical training combined with practice teaching and industry internships. Helped with decision to continue working in engineering in manufacturing.
- Instructors, worked into the field of engineering prior to teaching. Good experiences shared with students on what to expect.
- Drafting & Design classes
- Most valuable coursework consisted of introducing many concepts and process. I think the processing, and the process, which Ferris utilizes by "hands-on" work, allows graduates to start being productive with minimal training.
- Four hour long drafting labs was good preparation for a real drafting job.
- The instruction and projects were practical and relevant to current industry standards.
- CAD portion, because all the companies I was looking at only used CAD.
- Drafting classes

- Understand dies & molds- The more you understand what you're trying to make the easier to learn how to design them. Machine shop- Easier to design tools if you have a strong understanding of tool making, you will know your limits and design tools more cost effectively.
- Hands-on type of learning with 3 hour drafting labs in the major area of manufacturing, plastics, stamping dies, jigs, and fixtures.
- Understanding design fundamentals
- Hands-on drafting, machine tool, welding, and related classes
- The computer work because it keeps you up to date with today's technology.
- Hands-on education. Industry based course work. Experienced (industry) staff.
- CAD work, because it was useful in the work force
- Descriptive geometry because it provides the bases for all drafting.
- Design and study of dies, molds & fixtures. When I was hired at Capitol Engineering I knew what a die set, trim steel, burn out, etc where. I knew the basics.
- Extensive design classes, because it made me very capable.
- Knowledge of drafting practices & techniques
- Board work- Need to understand the basics
- Development of mechanical concepts
- Actual board drawings
- Mechanical drafting gave me the ability to read drawing prints.
- General engineering principles
- Board work
- Tool design
- The instructors in the matter labs gave me a sense of work ethics and expected me to put out accordingly.
- Balance of education. Technical writing
- Drafting and design courses
- Having an instructor from the industry.
- CAD and tool design
- Metallurgy/Basic fundamentals drafting. The base fundamentals of drafting are the foundation of understanding how designs go together. Packaging is important.
- Drafting labs
- Learning the basics on the board

Section 3 Question 2

Graduate Follow-up Survey
Exact comments are as follows:

What do you believe was the least valuable part of your coursework and Why?

- Mold flow: software was outdated and poor instruction.
- Metallurgy (very poor instructor)
- I think that the social awareness and cultural enrichment electives was the least valuable because they have not given me any practical knowledge that I can use in my job.
- I did not find anything that was of my value.
- Too much general education need more technical courses
- Metallurgy
- Welding
- The pencil and paper design work. That's what high school was for.
- I wouldn't say least valuable but I feel that drafting on the board was not valuable compared to other classes.
- The physics classes were the least important.
- Some of the general classes which were unrelated and a waste of time!
- Training with CAD 3D
- General education classes.
- That was 30 years ago.
- Not sure didn't seem like there was any wasted classes.
- Social science
- Electives.
- It was a great program at the time.
- Involving beams and cantilever effects I have found this has not been helpful.
- Board work obsolete
- Metallurgy was very weak. The English and writing classes were weak these are very important to being a successful employee.
- All course work was valuable do to the fact that so much was covered in a two degree.
- I think the program was pretty well organized
- Electricity/sound/light it wasn't deep enough to learn to much
- Metallurgy, course was way too technical.
- That was a long time ago. There have been many changes.
- 1 bad instructor Anderson.
- Can't think of any.
- Drawing everything on the old drawing boards because nobody uses them anymore.
- Arts and ideas I had about general education.

- Time spent on drawing technique.
- GD & T lack of Knowledge
- Nothing comes to mind as not important.
- I would have to say mold flow analysis unless a student knows that they want to pursue plastics, the mold flow analysis was useless.
- The genera education courses like history and literature are not need at all. I do not see how these pertained to the drafting field. I understand that these are university regiments not necessary the programs.
- Whether you appreciate the course or not, or courses serve to enhance your knowledge and skill level. I wouldn't remove any.
- Slide Rule-never used it after college. Any and all math that was required was done manually-Trig was done using the book of tables. Note: hand held calculators weren't invented until the late 60s.
- I really felt almost all of the classes were valuable and applicable in the working world.
- Most of the elective classes that were required have provided little value throughout my career.
- Physical Education requirements.
- Non related courses such as Michigan history were not as valuable for job prep.
- The extend of the manual drafting labs was excessive with the trend moving to CAD, I think more lab time. In a CAD lab would have been beneficial.
- Learning product design.
- General Education
- Descriptive Geometry - do not use in my current position
- Electives
- The non college credit given in the Tech programs. We were not given options to take "real" college credit courses. There was only 1 option to get a BS out of Ferris and that was teaching.
- Welding course- should have been more hands-on
- High school math
- Computer programming class. We were taught in basic program format which is not used in manufacturing.
- Health & Physical classes
- General studies class such as Molders of Thought were not pertinent to my field of expertise or subsequent employment.
- Basic subjects
- 3D CAD class, as it didn't' work correctly.
- Technical report writing
- Orientation classes- they didn't have anything to do with design
- GD & T- I have barely used it. And in most cases, a GD & T key is present on the part print
- Slide rule

- Hand drawing because it was time consuming and you couldn't get more assignments done.
- Humanities
- Physical ED & Health classes
- Physical ED
- Mold design because many companies would not hire with no experience
- Physical ED
- Lettering
- Physical education
- AUTOCAD
- Gym class
- Philosophy
- Fundamentals of Drafting (Board)
- Cultural enrichment courses that were available
- Fluid mechanics and kinematics
- Calculating machine- Technology Changed rapidly
- Too much time was spent on the board (hand drawings). Hand drawing is beneficial, but should be reduced.

Section 3 Question 3:

Graduate Follow-up Survey
Exact comments are as follows:

Please list any other course(s) that you think should be included in the program.

- Basic plastic processing class
- Design of multiple component assemblies.
- I think the program should include a course in machine design. This would help increase the Mechanical aptitude of the students
- I am not familiar with your present course list
- Processing- quality control.
- CAD with solid modeling and surfacing plastics.
- Do not drop the descriptive geometry courses.
- Report writing and presentation skills to Mgt. Lasers/Cutting edge technologies in MFG. Process.
- Being in the die side industry for a while, I would like to have a forming simulation or a flat blank layout of class. This would have made starting a strip layout easier for the first few times.
- If they are not already included, I would add: Precision measurement/inspection techniques, and G.D. &T.
- Measurement, quality standards and basic SPC
- There are many CAD programs out there now a basic learning of all of them would be helpful.
- More machine shop or CNC programming type courses and LABS.
- I believe it has been watered down a lot since I have left.
- Hands on machine shop classes
- Automotive design
- Pro E
- How GD&T is used to build fixtures and check parts once in production.
- You pretty much hit what was need on the other page. More English and writing classes.
- Increase GD&T exposure. GD&T CAM
- Interpersonal communications
- Problem solving, efficiency on the job, communicating, and leadership.
- More emphasis on using CAD as design tool. Not just how to operate it.
- CAD more machine shop procedures.
- CAD computer drafting 2D and 3D and finite element analysis
- Some type of basic instruction on various manufacturing operations. (Stamping, inj. Molding, machining, casting) understanding the process and end use is important. Product development life cycle would be nice.
- I am not aware of the new curriculum but don't teach all CAD

- Heavier emphasis on what is being drawn. Introduction to molding, stamping, extrusion, and casting.
- More of machining classes. Mainly about die making
- I think work processing, spreadsheet, and maybe even scheduling training would be very useful for preparation to the work force..
- Some electrical classes would fit very well no matter what field you will be going into.
- Business & customer service engineers are a very important part of the business work. Negotiating and selling their services.
- Just more
- Product designers new to the metal stamping industry are not aware of the formability of stampings. Tours of die shops or stamping manufactures would greatly help the education for those interested in product design. Too many times have I seen parts designed that can not be manufactured.
- Exposure to materials and processing with examples of product design application is invaluable for creative design. Do you have a materials library?
- In today's environment, as many computer related courses available.
- Additional machine tool exposure and carrying over design projects generated from machine tool situations.
- General plastics part design - more GD & T training. Rapid prototyping methods (SLA) and some CNC Training.
- I think GD&T is a bigger focus now in the auto industry, more focus here would be beneficial.
- CAM programming and surfacing for cutter paths (may be in the curriculum) including a CNC machining lab. This is a Trend I see where the surfacer is responsible for their cutter path.
- More machining courses.
- Network course for typing systems together some standard CAM software course such as smart CAM.
- More math
- More design work
- Management/Basic Office or department training
- Basic Management principles
- GD & T
- Problem analysis and resolution. 6-Sigma Quality process. Reliability. Statistical Process Control, Spreadsheet and slide presentation applications
- MA Models. Understanding critical dimensions
- GD & T
- Reinstate orthographic projection
- Personal computer classes and written and communications skills
- More surfacing & Tool pathing
- CAD for solid modeling for all the major companies in the world.
- More design and concepts

- No ADD's- Good program!
- Supervision
- * Keep current with the best industrial practices. Hardware, software applications & good old problem solving.* Knowledge of manufacturing priceless, good designers must know rapid prototyping system in all 3D course work.
- Cover's latest technologies in manufacturing. Cost and Quality program.
- Business course to help understand the cost side of design.
- Better CAD system, CATIA V5. Everyone is going to it.
- More metallurgy and advanced MFS processes
- Cultural diversity, as most industries are international it would keep to have some basics of other countries.
- Higher level of CAD software
- DFMEA
- Mold design
- Basic machine tools & metallurgy
- Multiple CAD packages provided by "The Big Three" as well as AutoCAD should be stressed in place of the high amount of "board" work. GD &T product detailing I depth!

Section 3 Question 5:

Graduate Follow-up Survey
Exact comments are as follows:

What trends in the drafting and tool design industry do you see impacting the CDTD program at Ferris in the next 5 years?

- SOLIDS, SOLIDS, SOLIDS
- Off shore (INDIA) for basic design of detail. Placement of GD&T in the CAD model for paperless engineering.
- Advanced 3D modeling. Rapid Prototyping
- Reducing boards or elimination there of solids minimal orthographic
- Solid modeling
- More extensive math modeling.
- Lap top computers with capabilities of desk top, wireless computers and accessories (printers, scanners, web) flat screens.
- 3D design such as Unigraphics
- Web based and web enabled tools. CAD templates and start parts, libraries. Collaboration and translation software.
- I wonder to what (if any) extent graduates will be expected to be proficient with animation software for presentations. This may be more important for students who enter into product design, rather than strictly tool design.
- CAD/CAM needs to educate on the CAM side a lot of designs are used right from design to tooling.
- Solid modeling and die simulation software advances that might take some of the "guess work" out of tool design and build.
- Actual use of solids and parametric in the industry. Product data management systems.
- CAD 3D solids
- Virtual design
- It is going to go from the engineering room to the machine cutting on the floor of manufacturing.
- GD&T
- I am an owner of a small business. Our company designs and builds automated machinery. I have 4 mechanical designers on staff. The people that excel are able to interface with the customers, highly technical, and self motivated. Keep striving for those.
- 3D solid design is the future in all aspects of tool design.
- At this time we are converting to Unigraphics solids. We have a hard time getting people who can both operate the system and design tools. A lot of the basic mechanical skills are lacking.
- CAD and various software programs
- Rapid prototyping and finite element analysis, 3D modeling
- 3D modeling

- A work force that does not want to work.
- Solid modeling either pro engineering or ideas.
- The need for good solid design drafting skills is still important. Students need to have a good understanding of plastics and manufacturing processes.
- Teaching a software package severely limits student marketability.
- Simulation software (Attair, Pamstamp, Dynafoim) Learn more on how to make a die work.
- I feel that 3D modeling (solids) is the wave of the future. Pro – E, Inventor, solid edge or the like are becoming very popular
- Yearly updates of CAD programs and new technology that is available for all areas of the workforce. The bad thing is with the upgrades to the cad programs they require more computers to run them.
- Mold flow analysis.
- The impact of new computer systems.
- 3D solids are the latest trend in the Die Design and die build field.
- Web integration and GD&T
- Advancements in CAD technology will continue to grow the lines between industrial design, product engineering, industrial engineering, marketing and promotions and life cycle management, until the same basic CAD model supports them all. The modeler will need a good understanding of product development processes to support these various functions.
- The extensive use of CAD applications in the typical work place has created more of a demand for higher skill levels for entry-level personnel.
- Rapid 3D modeling work to eliminate need for prototyping.
- 3-D modeling and paperless systems designs without prints to manufacture.
- The extensive use of solid modeling capabilities continues to be a driving force in today's market place.
- Industry STDS reduce lead-time, first shots had better be 95% perfect. From a design perspective this means the designer has to be efficient. Surface and create his own cutter paths and parting line run outs and rely on the tool maker to hit their schedule. (Work smarter) how you teach that I don't know.
- Advances in software, working with overseas partners.
- Keeping up with technology.
- Simulation Rapid proto typing
- More software
- Technology! Using customer models to design fixtures, tooling & gauges
- We using more kinematics studies now. Emphasis is placed more on the design being perfected before any actual samples are built by using FEA software.
- Great adduces in software. Various programs for product & tool designing.

- The ever-changing software advancements and the increasing number of different brands. Educating the students for versatility in these various packages.
- CDTC must be able to keep up with technology and industry!
- Global sourcing is causing tooling purchases form outside the United States. Production of tooling and details without detail drawings.
- From the product design standpoint a large number (percentage) need FEA. A basic knowledge or introduction in this area may be helpful.
- All design will be completely 3D. Some simple 2D drawing may be needed. All 3D properties are directly made form 3D CAD models.
- AUTOCAD solid drawings
- Most CAD programs are going to 3D solid modeling. Introducing more CAD programs would help in the field.
- CAD drafting, no manual drawing at all! Virtual 3D components testing, FEA simulations.
- Faster turn around to production. Rapid prototyping. Cost cutting.
- Global communications in engineering, since most of my designs end up being manufactured in Southeast Asia and China.
- I am afraid the US is and has been in decline as a Manufacturing/Industrial nation for some time due to cheap foreign labor. The concern. Where will our grads find work and what will be the quality or their lives in economic terms?
- Design fundamentals are sometimes overshadowed by "do it all" computer programs
- Software
- Data MGT, Dimensional MGT., Product MGT., Metrology * No paper, no prints*
- Software and hardware
- Staying on top of new CAD technology
- All forms of solid modeling
- Solid modeling
- Trying to keep up with the latest technology
- Shake out of different CAD vendor software packages. Hopefully an industry standard will emerge.
- Use of higher level CAD/CAM packages (Pro-E, Master Cam Etc.)
- Solid Modeling 3D and more efficient Methods
- Different design software programs. CATIA, solid works, vivigraphs.
- Virtual manufacturing & model simulation of parts and systems- 3D solids.
- CAD
- Although a strong background in drafting has been "priceless" for me, it seems that a 4-year degree with more engineering focused courses is being required today.
- CAD
- 3D modeling and paperless systems. Design without prints to manufacturing

- The solid modeling and integration to machine tools. It is economically feasible for even small shops to machine from CAD data.
- Solid modeling, Rapid tooling & prototyping
- Smart solids for specific functions in design.
- 3D CAD in tool design
- More solid modeling/ using pro-engineer/solid works

Section 3 Question 6:

Graduate Follow-up Survey
Exact comments are as follows:

Please add any general comments

- Great program learned a lot and had fun!!!
- I would be interested in any distance learning or Internet classes that FSU offers.
- The program and FSU is the best thing that has happened to me and my success.
- Would love the opportunity to teach at FSU.
- Worldwide collaborations with partners, suppliers and customers.
- I was in tool design field from 1962 until 1973 full time then part time for 5 or 6 years longer. Dec 1973 I became a deputy sheriff retired Jan 1999. March 1993 started part time Farrier business, which became full time Jan 1999.
- Do I still owe for a parking ticket?
- Keep up the Good Work
- The drafting part
- They did a great job for me thank you.
- I am very glad I decided to finish the BS program. It definitely gave me more opportunity in the marketplace.
- Of all the designers we see usually the FSU graduates are the best qualified. They are not afraid to take on a difficult job and think their way through it.
- The program gave me a great start in my career.
- I graduated in 1966 so I do not think I am a good person to comment.
- Ferris was great for me.
- Please tell them something that professor Robert taught us. "A good engineer doesn't need to know all the answers; he just needs to know where to find them.
- Our program is similar to FSU as far as I remember many of our employers come back because we teach manual practices and all tooling on the boards. CAD is a tool we get more work out of our students on the boards. We have 100% placement usually more
- *I have always appreciated the opportunity that Ferris has given me.*
- jobs than graduates. I have seen several programs eliminate the fundamentals and basics and students outcome profile are less employ capable we get a lot of feed back from our employees.
- The program was good. At that time the program could have transitioned more from the board to the computer.

- The teaching staff was very food to work with. Very informational and helpful. The program was a great learning experience for me as an individual.
- This was a good trip down memory lane. This industry has gone through some exciting advancements over the last 30 some years. Thanks for the opportunity to give you my thoughts.
- Before my present position I spent 5 years as a designer and 14 yrs. As a project engineer. My CAD experience was self taught on a foundation of tech. drafting that was irreplaceable. My experience of the program was good
- In 1985 this program was a good base to introduce students to a career in design
- In 1993 TDTD was a good introduction to Ferris and the mfg. industry. The program offered a few opportunities to pursue my BS or begin work as a mold design.
- We did not have the design programs, which are available in today's auto industry. I do not know what the program has currently; therefore my opinion is may be outdated.
- Your CDTD Program needs to be part of an apprenticeship program. Your can not get a drawing/design job without work experiences. Training is only one half of what is needed to get a design job.
- Great basic engineering background. I was well prepared for my career.
- In '73 the tool design was great. The class of the 90's and later is great on computers but have very poor mechanical background.
- Learn to appreciate a drafting table, pencil & eraser before looking at a computer screen.
- We need to bring production and assy. Back to the U.S.A. Being the middle-man in the market is not very economically sound.
- After Ferris I had a tough time finding a drafting job, finally found one that paid to learn CATIA. Contents into Chrysler for 5 years. Now I'm a lead designer for a Tier 1 supplier of head exchange components. The degree is a major bonus on my resume however the real world job is where I learned everything!
- Mr. Rynerson & Mr. Eldridge were very knowledgeable and helpful.
- Weekend AutoCAD updates for new programs, would be a good program addition. CAD introduced to drafting & Boeing in 1967.
- I would be happy to share my experience in the Automotive industry with your classes at Ferris or at JCI.
- I believe the integrity of the professors working in the field prior to teaching really establish credibility. When I was a student at FSU it seemed to be focused on Auto industry and for me personally it was good, however for furniture, sport recreation or medical industries the drawing standards are different, and it would have helped to have examples I class with not just "Auto Industry stuff."

- Keep up the good work. Mae students business smart with understanding of the world's capabilities.
- I personally received my working tools for life in these 2 years.
- Students should design a "complete" package using a supplied model (FIXT Design, Tool Design & Gage design). Possible have MFG., product students work with 2 year students on a large senior project. MFG. Submits an order to CAD students to design a certain FIXT/Gage/Tool.
- For me, FSU was a great experience that prepared me for life with real skills.

APPENDIX C

Section 3 – Employer Follow-up Survey

Supporting Information

Employer Follow-up Survey

Ferris State University
CAD Drafting / Tool Design
Industry Survey

Please answer the following questions by either writing your answer in the space provided or by circling the number for the most appropriate answer.

I. The number of employees in your company:

1. 0-50 2. 50-100 3. 100-500 4. above 500

II. Your primary manufacturing process is:

1. Molded plastics
2. Metal stamping
3. Tool building
4. Design
5. Other

III. How many tool designers/detailers does your company employ?_____

IV. Does your company build tools in-house or contract tools to be built outside?

1. In-house 2. Outside 3. Both 4. Does not apply

V. What percent of your companies tools do you design in-house and what percent do you contract for outside design?

1. % in-house_____ 2. % outside_____ (total 100%)

VI. What types of tools are used by your company? (circle all that apply)

1. Injection molds
2. Compression molds
3. Blow molds
4. Vacuum forming
5. Extrusions
6. Special Machines
7. Gages
8. Other tools
   specify_____
9. Progressive dies
10. Draw dies
11. Compound dies
12. Transfer dies
13. Fixtures
14. Multi slides / 4 slide
15. Die casting
16 Other casting processes
   specify_____

VII. What salary range would you start a 2-year associate degree tool designer (include overtime)?

1. $20,000 - $25,000
2. $25,000 - $30,000
3. $30,000 - $35,000
4. $35,000 - $40,000
5. $40,000 - $45,000
6. More than $45,000

VII. What percentage of the total designs are created on CAD verses the board?

% CAD_____ % Board_____ (total 100%)

IX. What percentage of your CAD tool designs are generally 2 dimensional or 3 dimensional ?

% 2 Dimensional_____ % 3 Dimensional_____

X. Please rate the relevance of the subject areas of study in the CAD Drafting & Tool Design program to your work. This will help us rate our present program as well as possible future revisions necessary to stay up-to-date with current and future graduates.

	Very Important				Not Important
Fundamentals of Drafting	5	4	3	2	1
Introduction to CAD	5	4	3	2	1
Descriptive Geometry	5	4	3	2	1
Product/Tool Detailing	5	4	3	2	1
Computer Aided Drafting	5	4	3	2	1
Tool Design	5	4	3	2	1
Die Design	5	4	3	2	1
Mold Design	5	4	3	2	1
Basic Machine Tools	5	4	3	2	1
Advanced Machine Tools w/CAM	5	4	3	2	1
Solid Modeling w/parametrics	5	4	3	2	1
Physics	5	4	3	2	1
Introduction to Materials	5	4	3	2	1
Dimensioning and Tolerancing	5	4	3	2	1
GD & T	5	4	3	2	1
Product Assemblies & Detailing	5	4	3	2	1
Moldflow	5	4	3	2	1
CAE	5	4	3	2	1

XI. Please circle the number that indicates the level of importance the following skills are for a qualified tool designer:

	Very Important				Not Important
1. Board drafting/Sketching	5	4	3	2	1
2. Descriptive geometry	5	4	3	2	1
3. CAD 2-D	5	4	3	2	1
4. CAD 3-D modeling	5	4	3	2	1
5. CAD surfacing/solid modeling	5	4	3	2	1
6. Dimensioning , tolerancing and GD&T	5	4	3	2	1
7. Product design/detailing	5	4	3	2	1
8. Gage design	5	4	3	2	1
9. Jig & fixture design	5	4	3	2	1
10. Die design	5	4	3	2	1
11. Mold design	5	4	3	2	1
12. Special machine design	5	4	3	2	1
13. Automation and system design	5	4	3	2	1
14. Materials and material selection	5	4	3	2	1
15. Moldflow	5	4	3	2	1
16. Physics	5	4	3	2	1
17. Static and strength of materials	5	4	3	2	1
18. Computer aided FEA	5	4	3	2	1
19. Kinematics	5	4	3	2	1
20. Fluids (hydraulics,pneumatics)	5	4	3	2	1
21. Rapid prototyping	5	4	3	2	1
22. Electronic and electrical sensors for tooling	5	4	3	2	1
23. Manufacturing processes	5	4	3	2	1
24. Welding & metal joining processes	5	4	3	2	1
25. Machine tool fundamentals	5	4	3	2	1
26. Advanced machine tool with CAM	5	4	3	2	1
27. Die & mold construction and repair	5	4	3	2	1
28. Quality control and SPC	5	4	3	2	1
29. Design for manufacturing	5	4	3	2	1
30. Process planning and estimating	5	4	3	2	1
31. Body design	5	4	3	2	1
32. Metrology	5	4	3	2	1
33. Internship for tool design	5	4	3	2	1
34. CIM (computer integrated mfg)	5	4	3	2	1
35. CAD macro creating/system customization	5	4	3	2	1
36. Rapid Prototyping	5	4	3	2	1
37. Speech & English	5	4	3	2	1
38. Tool tryout and processing	5	4	3	2	1
39. Computer applications (spreadsheet, word processing, data base, data transfer)	5	4	3	2	1

		Excellent				Poor
XII.	Quality of Ferris CDTD graduates	5	4	3	2	1

XIII. Please provide any additional comments you feel would be important to improving our present program.

Thank you for your assistance

SECTION 2

GRADUATE FOLLOW-UP SURVEY

A. PROGRAM TASK

Graduate Follow-up Survey: The purpose of this activity 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 program in terms of job placement and preparedness of the graduate for the marketplace.

B. SUMMARY OF GRADUATE FOLLOW-UP SURVEY

This section of the Academic Program Review Report summarizes and/or displays the results of the CAD Drafting Tool Design (CDTD) Alumni survey conducted April, 2003. The information received from 121graduates indicates that the CAD Drafting Tool Design program provides the graduate with an exceptional education. Alumni of the CAD Drafting Tool Design program were satisfied with their education at Ferris, they were able to find good, well-paying positions, continue with their education, and seek additional career options by which the CAD Drafting Tool Design program laid the foundation. The survey results indicate that the CAD Drafting Tool Design program at Ferris is a proven contributor of highly trained and educated graduates for Michigan and the Great Lakes region in the Drafting and Tooling areas that it teaches. The survey has determined that the CDTD program is a core program at the University.

Section One (page one): In section one of the graduate follow-up survey we wanted to find out information about the CDTD graduate.

Question: Did you receive a BS degree from Ferris?

Yes: 60 (50%) No: 61 (50%)

The CAD Drafting Tool Design program is a solid provider of the 2+2 programming concept at Ferris State University. A total of 60 respondents indicated that they received a BS degree from Ferris. The following College of Technology programs; Plastics 6 (10%), Manufacturing 16 (27%), and Product Design 13 (22%), account for 59% of those going on for a BS at Ferris. The College of Business accounts for 6% (4) of those seeking a Bachelors degree in a business related field. The College of Education accounts for 35% (21) of CAD Drafting Tool Design graduates seeking a Bachelors degree.

Question: Did you receive a BS degree from another university? If yes, name of degree and university.

Yes: 23 (19%) No: 98 (81%)

Of the 121 yes replies, 8 indicated that they also earned a Masters degree.
The following is a list of Universities of those that earned a BS or MS degree outside of Ferris (and in some cases the degree earned).

B.S. Civil Engineering
M.S. Michigan State University
M.S. Industry Eng., WMU.
Finance, Walsh College
Central Michigan University
BSME University of Michigan
BS Western Michigan University
B.S. Business &Mang. Athos State
MBA Gannnon University
Industrial Mgmt.
B.S. El. Education SVSU
M.A. Eastern Michigan University
Oakland Community College
Construction Tech. SVSU
B.S.M.E Western Michigan U.
Michigan State University
MSU AG Engineering
M.S. Eng. Mgt.- Western Michigan U.
M.S. Western Michigan University
Eastern Michigan University
BAS University of Michigan
M.S. Georgia Southwestern U.
M.S. Engineering MGT WMU

Question: What is your present job title?

Of those responding, 84 of 121 (70%) have titles that are CAD Drafting Tool Design or closely related. An impressive 50 respondents had the word engineering in their job title. Nine indicated that they are involved at some level of education.

President
Senior Project Bridge Design Engineer
Designer
Product Engineer
Product Engineer
Teacher
Design Engineer
Doctoral Associate
President
Project Manager
Cost Estimator
CAD Programmer
President
Materials Mgmt. Analyst
Application Engineer
Engineering Technician
Manufacturing Engineer
Director-Sales & Marketing
Engineering Supervisor
Design Engineer
Cost & Pricing MGR
Director; Product Development IT
Program Leader
Sr. MRO/Buyer Planner
PDM/CAD Systems manager
Senior Manufacturing Engineer
Electronics Supervisor FAA
Mold Designer
Principal Engineer/Manager
Product Engineer
Retired
Professor
Design Supervisor
Senior Manufacturing Project Eng.
Self-Employed
Farm Manager
Manager, Design Services
Drafting Teacher
Hardware Application Engineer
Engineering Manager

Design Engineer
Tool Designer
Consultant
Farmer
Chief Engineer
Project Engineer
Manufacturing Engineer
Product Design & Engineer Super.
Product Engineer
Design Release Engineer
Project Engineer
Product Designer
Project Engineer
Owner, President
President/Owner of Koops Inc.
Co-president
Tool & Die Design Leader
Attorney
C.E.O
Design Engineer
Manufacturing Engineer
Associate Professor
Principal of High School
Product Development Eng.
CAD Engineer
Professor, Drafting & Design/CAD
Product Planner/Mgmt
Chief Engineer
Assistant Principal- Elementary
Machine Designer
Professor
Product Engineer
CAD Tool Design Journeyman
Project Tool Engineer
Senior Designer, Dies
Assistant Professor
Manager Test & Analysis Dept.
Tooling Designer
Director of Engineering
Sr. Construction Manager

Design Engineer
Tool Designer
Consultant
Farmer
Chief Engineer
Project Engineer
Manufacturing Engineer
Product Design & Engineer Super.
Product Engineer
Design Release Engineer
Project Engineer
Product Designer
Project Engineer
Owner, President
President/Owner of Koops Inc.
Co-president
Tool & Die Design Leader
Attorney
C.E.O
Design Engineer
Manufacturing Engineer
Associate Professor
Principal of High School
Product Development Eng.
CAD Engineer
Professor, Drafting & Design/CAD
Product Planner/Mgmt
Chief Engineer
Assistant Principal- Elementary
Machine Designer
Professor
Product Engineer
CAD Tool Design Journeyman
Project Tool Engineer
Senior Designer, Dies
Assistant Professor
Manager Test & Analysis Dept.
Tooling Designer
Director of Engineering

Quoting Manager
Manufacturing Engineer
Design Leader Technical
Project Engineer
Manufacturing/Quality Engineer
Tool & Equipment Designer
Project Planner
Engineer
Designer
Engineering Manager
Product Designer
Business Unit Manger
Instructor GRCC and Ottawa Hills
Business Owner
Self-Employed
Program Manger/Sr. Project Dir.
Program Manager
Designer
Mechanical Designer
Project Engineer
CAD Applications Support
Director of Sales
Sr. Product Develop. Engineer
President, Flex-Tec
Director of Manufacturing
Sr. Project Engineer
Principle Engineering Supervisor
Service Engineer
High School Drafting Teacher
Test Engineer
Sr. Product Specialist
Manufacturing/Quality Engineer
Manufacturing/Quality Engineer
Design Leader Technical
Project Engineer
Manufacturing Engineer
Quoting Manager
Sr. Construction Manager

Question: What is your employment address? (location)

Of those responding (86%) have ZIP codes from 46000-49999 (Great Lakes region), indicating that the CAD Drafting Tool Design program provides graduates to the region. Nine states are represented in the survey: Ohio, Georgia, Indiana, Illinois, Colorado, Texas, Washington,
Missouri, and Ohio.

Question: What was your starting salary after graduation? 92 respondents indicated as follows: 25 (27%) stated that they started below $20,000 per year. 51 (56%) stated that they started between $20 and $30,000 per year. 17 (19%) stated that they started between $30 and $40,000 per year. 5 (6%) stated that they started between $40 and $50,000 per year, and two respondents made above $50, 000 per year as a starting salary. *Note should be taken that the sample data reflects graduates that graduated from 1972 to present.*

Question: What is your present salary range? 108 respondents indicated as follows: The largest group 30 (28%) indicated that they are now making in excess of $90,000 per year with one respondent indicating a current salary of $125,000. 4 (4%) indicated that they are now making less than $20,000 per year. 6 (6%) indicated that they are now making between $30 and $40,000 per year. 15 (14%) indicated that they are making between $40 and $50,000 per year. 17 (16%) indicated that they are making between $50 and $60,000 per year. 18 (17%) indicated that they are making between $60 and $70,000 per year. 18 (17%) indicated that they are making between $70 and $80,000 per year. There were no responses indicating a salary range between 80 and $90,000 per year!

Question: Was it difficult to find a position in a Drafting/Tool Design or closely related field upon graduation?

As a core program at Ferris, very few graduates found it difficult to find a starting position in the CAD Drafting Tool Design field. 85% of the respondents indicated that they had no problem finding a position in CAD Drafting Tool Design or a closely related field. The CAD Drafting Tool Design program graduates have consistently found positions that meet career starting expectations.

Section Two: In this section of the Graduate Follow-up Survey we asked the alumni to evaluate the CAD Drafting Tool Design program courses and if the knowledge they gained helped prepare them for employment.

TABLE 1: The table below represents the actual number of responses (top section) and the percentages (bottom section) to the questions on Page two of the survey.

Question #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
To a Great Extent (1*)	94	28	72	80	20	24	73	66	37	55	26	30	38	40	39	11	82	40	23	24	57	67	78	87
Somewhat (2*)	20	26	39	29	20	7	40	41	33	54	22	55	54	3	35	22	38	57	65	26	44	46	30	25
Neutral (3*)	4	4	6	7	9	10	5	11	13	8	18	30	17	12	15	18	2	21	25	11	13	4	4	4
Very Little (4*)	2	2	1	1	4	8	2	0	3	1	2	4	6	2	3	6	0	3	6	8	5	3	1	0
Not at All (5*)	0	17	1	1	20	22	1	2	9	1	15	3	1	10	4	19	0	0	1	14	1	1	3	1
Total	120	77	119	118	73	71	121	120	95	119	83	122	116	67	96	76	122	121	120	83	120	121	116	117
Average (*)	1.3	2.4	1.5	1.4	2.8	3.0	1.5	1.6	2.1	1.6	2.5	2.1	1.9	2.1	1.9	3.0	1.3	1.9	2.1	2.5	1.7	1.6	1.5	1.3
Percentages of total																								
To a Great Extent	78	36	61	68	27	34	60	55	39	46	31	25	33	60	41	14	67	33	19	29	48	55	67	74
Somewhat	17	34	33	25	27	10	33	34	35	45	27	45	47	4	36	29	31	47	54	31	37	38	26	21
Neutral	3	5	5	6	12	14	4	9	14	7	22	25	15	18	16	24	2	17	21	13	11	3	3	3
Very Little	2	3	1	1	5	11	2	0	3	1	2	3	5	3	3	8	0	2	5	10	4	2	1	0
Not at All	0	22	1	1	27	31	1	2	9	1	18	2	1	15	4	25	0	0	1	17	1	1	3	1

Reference: For each question, To what extent did the course knowledge in the following areas prepare you for employment?

1. Fundamentals of Drafting	13. Material Science
2. Introduction to CAD	14. Product Detailing w GDT
3. Descriptive Geometry	15. Product Assemblies
4. Product Detailing	16. MoldFlow
5. CAD 3D Wireframe and Surfacing	17. Overall Technical Training
6. CAD 3D Solids	18. Gaining a broad General Education
7. Tool Design	19. Writing Clearly and Effectively
8. Die Design	20. Acquiring proficiency with computers
9. Mold Design	21. The ability to learn on your own, pursue ideas, find information..
10. Basic Machine Tool Operations	22. How effectively did Ferris prepare you for employment?
11. Advanced Machine Tools w/ CAM	23. In general, How satisfied were you with your experience…
12. Physics	24. Would you recommend the CDTD program to a friend/relative?

Refer to Table 1: You will find the data tabulated in columns with the corresponding course or knowledge listed in the chart below the data. Page 2-7 provides a summary of the most important aspects of the data.

TABLE 1 SUMMARY:

The first 16 columns of the table deal with specific program courses or knowledge areas.

Of the specific program areas (#'s 1-9, 15 and 16), the Fundamentals of Drafting (#1) had an overwhelming response of 78% that the classes prepared them *To a Great Extent*, Question 3,4, and 7 each had a 60+ % response for *To a great extent*. The lowest rating for *To a great Extent* was question 16 with a rating of 14. On the other end of the scale *Not at All*, 17 of the questions had responses in the single digits and questions 2, 5, 6, and 16, had ratings of 17, 20, 22, and 19% respectively. Only one question (#16 MoldFlow) had a larger response (29%) for *Somewhat* than *To a Great Extent*.

In the Design areas a combined percentage of *To a Great Extent and Somewhat was as follows:* Tool 89%, Die 74%, and Mold Design 91%. The three CAD specific questions (#'s 2, 5, & 6) had a more flat response. Combined percentages for To a Great Extent and Somewhat were as follows: CAD Introduction 94%, 3D Wire Frame 54% and 3D Solids 44%. MoldFlow (#16) was the only area that had both higher responses in the categories of *Somewhat* and *Neutral* than in the category of *To a Great Extent*. The numbers in the categories for MoldFlow are not too surprising as many respondents do/did not work in the molding areas and even fewer would use or apply the technology. The general comments (last section of this survey), support the responses stated here.

In the technical related areas (#'s 10-13), the category of *Somewhat* is the highest response area, followed closely by either *To a Great Extent* or *Neutral*.

In the general areas (#'s 17-24); an overwhelming 74% indicated that they would recommend the CAD Drafting Tool Design program to a friend or relative. To Overall Technical Training, 67% indicated *To a Great Extent* that the course knowledge prepared them for employment. An incredible 93% indicated that *To a Great Extent* or *Somewhat* to the question, in general, how satisfied were you with your overall experience in the CAD Drafting Tool Design program?

Section Three: This section of the Graduate Follow-up Survey was designed to gain information on the following areas:
(See Appendix B for specific comments for each question)

1. What was the most valuable part of the course work?
2. What was the least valuable part of the course work?
3. List other courses you think should be included in the program.
4. What year did you graduate and what did you think of the facilities?
5. Over the next five years, what trends in drafting and tool design will impact the CDTD program?
6. Any General Comments.

1. What do you believe was the most valuable part of your coursework and why? (See Appendix B for specific comments for each question)

Of the 121 written responses to this question, 50 respondents indicated that Drafting (among other courses) was the most valuable to them. An impressive 71 indicated that the design component was the most valuable. The combined Board and CAD fundamentals response comprised 39 respondents to indicate that those areas were most valuable. Twenty-six indicated that the Lab aspect and 11 indicated that stressing fundamentals (standards) of CAD Drafting Tool Design program was the most valuable. All major aspects of the program were indicated to be important at one time or another. Many instructors were identified, as well as their industrial experiences, as contributing to the overall importance of their coursework. Related classes (material sciences, machine tool) as well as physics and math were also identified as very important to the overall value of course work taken at Ferris.

2. What, so you believe, was the least valuable part of your coursework and Why? (See Appendix B for specific comments for each question)

Of the 121 respondents, several stated *"None, use it all"* or a very similar comment. Many comments indicated that classes in the General Education areas were least valuable. Specifically in the major area, MoldFlow was indicated as least valuable. Related classes; material science, and strength of materials were identified as least valuable. While 10 respondents indicated that a particular course was not valuable, they also stated that they were not part of that particular industry.

3. Please list any other course(s) that you think should be included in the program. (See Appendix B for specific comments for each question)

The varied responses make it impossible to state a trend or theme. Statements from: Self Esteem, Career Goals and Setting, Employee Relations, to Analytical Team Problem Solving, Business Law, Project Management, and statements in the technical areas of DFM, FEMA, RP, SLA, CAD, CAM, GD&T, TQM, Lasers, Machine Design, Business and Customer Service and ending up with "more advanced CAD, Solids, etc." indicate that the CAD Drafting Tool Design program serves a basis of many areas that our grads end up working in.

4. What did you think of the CDTD facilities? (See Appendix B for specific comments for each question)

In response to this question, the overwhelming response was: good, great at the time, very good, excellent, etc. Several respondents stated that the CAD systems were "in need of updating" etc. Several respondents indicated that computers were not available all the time. General comments also indicated lack of heating cooling, and quality of boards and computers, were mentioned. *Note: The facilities have been improved within the last year in one of three rooms that the students utilize.*

5. What trends in the CAD Drafting Tool Design industry do you see impacting the CDTD program at Ferris in the next 5 years? (See Appendix B for specific comments for each question)

The statements to this question have a significant attribute of the computer and Solids Modeling. Statements of Solids and advanced Solid Modeling were stated with regularity. With high end applications of CAD, CAM, SLA (many respondents actually specified specific software) being a concern for the future workforce as approximately 60% indicated this trend will have an impact on the program. Indicators of ProE, CATIA, Unigraphics and general Solids are stated as future needs of the Ferris CAD Drafting Tool Design graduate. Knowing rapid changeover and tool performance also were indicated as future considerations for the program. Ten respondents made statements similar to: "do not lose track of the fundamentals of good design, etc".

6. Please add any general comments. (See Appendix B for specific comments for each question)

The comments were basically all positive in nature. Many comments were similar to: *"I have always appreciated the opportunity that Ferris has given me. It is difficult for me to imagine what my life would have been like without a degree from Ferris."* and *"Going to Ferris for CDTD was one of <u>the</u> most positive experiences of my life – Anyone who is*

considering a hands-on engineering degree should investigate Ferris' CDTD, The program gave me a great start in my career I would be willing to come to Big Rapids and talk with the CDTD classes." Similar to the Future Trends Question #5 many inferences to advanced CAD applications were stated again in a positive manner. A few comments were critical, "too focused on automotive... program should have an internship..., need to have industrial experience..., AutoCAD updates... needed etc.

SECTION 3

EMPLOYER FOLLOW-UP SURVEY

A. PROGRAM TASK:

Employer follow-up survey: This activity is intended to aid in assessing the employers' experiences with graduates and their perceptions of the program itself. A mailed instrument was used to conduct the survey.

B. SUMMARY:

This section of the Program Review Report summarizes the results of the CAD Drafting Tool Design Employer Survey conducted April 2003. The information received by employers shows that our CAD Drafting Tool Design graduates are providing industry with the type of skilled employee they are looking for. The survey also shows that we are providing graduates with an education that trains them to go into varied segments of engineering such as: product design, tool design, gage design, die design, mold design and machine design. *Due to the varied industries replying to the survey, some of the results are skewed toward specific processes. Care should be taken when evaluating the results and comments.* The results from employers indicate we are providing the solid design foundation companies need for highly skilled employees to design in today's sophisticated manufacturing environment. The survey was mailed to 220 employers. Approximately 70 were returned for insufficient addresses. Of the 150 remaining, 52 surveys were received for the APR analysis. This was a return rate of 34.7 percent.

I. Number of employees in your company?

1. (0-50) 18% 2. (50-100) 18% 3. (100-500) 46% 4. (above 500) 18%

II. Your primary manufacturing process?

1. Molded plastics 12%
2. Metal stamping 26%
3. Tool building 17%
4. Design 27%
5. Other 28%

III. How many tool designers does your company employ?

The average was 9.7 but this is a little misleading because several companies may have 100 designers because they are strictly a design house with no manufacturing

and others have zero or very few designers because they have their designs farmed out to design houses. The project leader who works with design services must have a thorough knowledge of tool design in order to get the properly designed tools for their company. Many former graduates from the CAD Drafting Tool Design program advance to these vital positions because of their education and experience.

IV. Does your company build tools in-house, or contract tools to be built outside?

In-house 14% Outside 23% Both 59% Does Not Apply 4%

V. What percent of your company's tools are designed in-house and what percent do you contract for outside design?

Percent in-house	52%
Percent outside	48%

VI. Why types of tools are used by your company?

Injection molds	23%
Compression molds	9%
Blow molds	0%
Vacuum forming	9%
Extrusions	9%
Special machines	45%
Gages	68%
Other tools	9%
Progressive dies	50%
Draw dies	27%
Compound dies	32%
Transfer dies	41%
Jigs/Fixtures	86%
Multi slides/4 slide	5%
Die casting	0%
Other casting	0%

VII. What salary range would you start a 2-year associate degree tool designer?

$20,000-$25,000	0%
$25,000-$30,000	33%
$30,000-$35,000	33%
$35,000-$40,000	24%
$40,000-$45,000	10%
More than $45,000	0%

VIII. What percentage of the total designs are created on CAD verses the board?

CAD 95% Board 5%

IX. What percentage of your CAD tool designs are 2 dimensional or 3 dimensional fully surfaced models?

% 2 Dimensional 70.3% % 3 Dimensional 29.7%

X. Please rate the relevance of the subject areas of study in the CAD Drafting Tool Design program to your work. This will help us rate our present program as well as possible future revisions necessary to stay up-to-date with current and future graduates.

(Very important = 5 Important = 3 No important = 1)

Fundamentals of Drafting	4.3
Introduction to CAD	4.5
Descriptive geometry	4.1
Product/Tool Detailing	3.7
Computer Aided drafting	4.5
Tool design	4.3
Die design	4.0
Mold design	2.7
Basic machine tools	4.0
Advanced machine tools w/CAM	3.1
Solid Modeling w/parametrics	4.0
Physics	3.3
Introduction to materials	4.5
Dimensioning & tolerancing	4.1
GD & T	3.7
Product assemblies & detailing	3.8
Moldflow	2.3
Computer Aided Engineering (CAE)	3.0

XI. Indicate the level of importance the following tool design skills are for a qualified tool designer.

(Very important = 5 to Not important = 1)	
Board drafting/sketching	2.8
Descriptive geometry	3.6
CAD 2-D	3.7
CAD 3-D Modeling	4.4
CAD surfacing and solid modeling	4.3
Dimensioning, tolerancing and GD&T	4.1
Product design and detailing	3.5
Gage design	3.1
Jig and Fixture design	3.5
Die design	4.1
Mold design	2.8
Special machine design	3.6
Automation and systems design	3.6
Materials and material selection	3.8
Moldflow	2.2
Physics	2.9
Static and strength of material	3.6
Computer Aided / FEA	3.8
Kinematics	3.2
Fluids (hydraulics/pneumatics)	2.7
Rapid prototyping	2.8
Electronics and electrical sensors	3.6
Manufacturing processes	4.7
Welding & metal joining processes	3.3
Machine tool fundamentals	3.8
Advanced machine tool with CAM	3.4
Die and mold construction and repair	3.7
Quality control and SPC	3.3
Design for manufacturing	3.8
Process planning and estimating	3.3
Body design	2.5
Metrology	3.2
Internship for tool design	3.8
CIM (computer integrated mfg.)	2.4
CAD macro creating/system customization	3.2
Speech and English	3.4
Tool tryout and processing	3.6
Computer applications (spreadsheets, word processing, database/transfer)	4.0

XII. Quality of Ferris CDTD graduates: 4.2

XIII. Please provide any additional comments you feel would be important to improving our present program.

- In addition to the technical aspects of the program, communication is vital. The business environment today demands clearly and succinct communication between departments.
- Focus on 3-D solid modeling – parametric or a hybrid.
- Teach CAM software, but even more important is high speed machining fundamentals along with basic machining theory.
- Really focus on strip development and part processing for progressive and line dies. That will open up part estimating opportunities. There is a lack of true talent in estimating.
- Hard Steel Cutting and Laser Cutting would be two areas that should be leading edge.
- It is important to instill and cultivate the goals of the completed design, and those different and creative methods can and should be used to reach those goals. Design work should not always be a "paint by numbers" approach.
- The ability to work in teams.
- We often hire Tool Designers and convert them to Product Designers.
- Students must have training in drawing (drafting) fundamentals. Have an understanding of machines and machine tools. Good communication skills, both written and oral, are very important.

SECTION 4

STUDENT EVALUATION OF INSTRUCTION

A. PROGRAM TASK

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 way to improve the effectiveness of the program and to enhance the fulfillment of their expectations.

The program continually monitors the curriculum, quality of instruction and courses taught in the CDTD program. The Student Assessment Instrument provides information and evaluation of course content and instructional quality. The CDTD curriculum is assessed with the help of industry advisors and visits to industrial facilities. CDTD faculty are evaluated by students on a semester schedule, the results provided to the faculty member. The Academic Program Review (APR) process also provides valuable input and self-evaluation of the program.

The results of the surveys have been used to identify instruction, content and courses that are viewed as a problem by the students. Problem areas are investigated to find the basis for the perceived problem. Changes in course texts, instructional delivery, course content and scheduling issues have been identified and used as the basis of change.

(The survey instrument and survey results appears in Appendix D)

B. SUMMARY OF SURVEY RESULTS

Student overall ratings of the program, facilities and instruction remains high. Students place a high value with the hands on approach of instruction and feel, the recently obtained, hardware, software and advanced rapid prototyping equipment is above average. The students feel that CDTD faculty care about their learning and the material is relevant to there Careers. Some questions areas are difficult

For the student to evaluate based on their limited experience, but student perceptions and concerns need to be considered.

FACILITIES:
One area of concern is the printers and plotters. 35% felt they were average or below. Another area of concern is the available lab hours. 70% felt the lab availability on weekends is average or below. The students also indicated dissatisfaction over the stability and performance of the computers in Swan 503. Many students indicated computer failures and system lockups during certain solid modeling projects.

INSTRUCTION:
Two areas of concern were identified by the student survey. The first concern was that course objectives are not identified clearly. The second concern identified by students is graded material is not being returned in a timely manner.

PROGRAM:
Students selected FSU and the CDTD program because of high school/career center instructors, quality and reputation of the program or interest in the subject area. 73% of the students indicated they would continue on for a baccalaureate degree. 18% of the students feel we should use CAD for 90-100% of the instruction and the other 82% feel we should use CAD between 50-80% of the time. Most meaningful student comments centered on improving some of the course content and methods of instruction. Other comments centered on the excessive amount of work required. (See appendix D for comments recorded as given)

and a commitment to the College of Technology. Positive strides are taking place within the admissions areas, the addition of admission support in the college of Technology is beneficial. Computer support personnel and the effectiveness of the support has greatly improved.

D. FACULTY SURVEY PERCEPTION RESULTS:

The following statements are a summary of the responses to the survey of faculty.

Curriculum Perceptions

1. The CDTD program should be expanded to four years.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
Responses		3		1

Comments:
None

2. The amount of Geometric Dimensioning and Tolerancing should be increased.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
Responses	2	1	1	

Comments:
- I think it is just enough for an introductory course.
- GD&T Is an important part of the program, we need some form of GD&T in the major classes.

3. The teaching and assigning of team projects should increase and possible CIM Projects should be considered.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
Responses 1	3			

Comments:
- CIM projects are not necessary.
- Maintain applications between courses and build on applications to reinforce theory and concepts.

4. *More computer aided engineering (CAE) courses and/or projects should be considered.*

	Strongly Agree		Neutral		Strongly Disagree
	1	2	3	4	5
Responses		2	1	1	

Comments:
- Should have die simulation introduced in the program.
- CAE helps with design application. This class should include mold and die design analysis.
- Implementing CAE technology in an AAS program needs to be very well thought out. Perhaps advanced Tool Design classes would be better for graduates.

5. *What percent of educational time in the CAD Drafting / Tool Design program should be spent on CAD?*

Responses

100%		70%	
90%	1	60%	
80%	3	50%	

Comments:
- Actual "board drafting" should be eliminated, and replaced with sketching and more CAD.
- Many advanced features of CAD utilization are not taught (customization, shortcuts, etc)

6. *If we were to reduce the amount of time spent on the drawing board, what objectives do you feel are the most important to be learned on the board? Please check all items that you feel are important board skills.*

	Important	Not Important	No Opinion
Geometrical Construction	2	2	☐
Orthographic Projection	4	☐	☐
Sketching	3	1	☐
Sectioning	2	1	1
Auxiliary Views	2	1	1

Dimensioning	3	☐	1
Assemblies	☐	3	1
Descriptive Geometry	3	1	☐

7. *For each of the items in the left hand column, please rate its importance to the program and curriculum at the present time.*

	Vital to Program	Necessary	Should be Included	Somewhat Necessary	Not Required
CAD Solid Models	3	☐	☐	1	☐
Parametric Models	3	1	☐	☐	☐
Rapid Prototyping	☐	3	1	☐	☐
CAE Static's and Strengths	☐	☐	☐	3	1
CAE Kinematics	☐	☐	1	3	☐
CAE Mold fill	☐	3	1	1	☐
GD&T	2	2	☐	☐	☐
CIM and other Integrated technology	☐	☐	☐	2	2

8. *Looking toward the next five years and beyond, what subjects and topics should be emphasized in the CDTD two-year degree:*

	Greatly Emphasized	Somewhat Emphasized	Not Important
Board Drafting	☐	2	2
CAD Drafting	4	☐	☐
Mold Design	4	☐	☐
Die Design	4	☐	☐
Jig. Fixture, Gage Design	3	1	☐
Special Machines	☐	4	☐
Product Design	2	2	☐
Dimensioning, Tolerancing , GD&T	4	☐	☐
CAE Applications	2	2	☐
3D and Surfaced Models	1	3	☐
Solid Modeling	2	1	1
Parametric Technology	3	1	☐
Rapid Prototyping	2	2	☐

Rapid Tooling	☐	3	1
Machine Tool	2	2	☐
Tool Building	☐	4	☐
Tool Path (CAM)	☐	4	☐
CMM	☐	3	1
Laser Measuring	1	2	1
Virtual Reality	2	☐	2
Die Simulation	3	1	☐
LENS Metal Prototyping	☐	2	1
Solid Modeling for Tooling	4	☐	☐
Other_____	☐	☐	☐

9. *From your perspective, what are the major strengths and weaknesses of the curriculum, for CAD Drafting/Tool Design program?*

Comments:
Strengths –

- Concerned faculty, ability to take a student with no prior experience and train them for a career in 2 years.
- Time on task.
- Committed faculty to the academics of the program, and to the students well being, including their education, personal life, and their future.

Weaknesses –

- The ability to keep up with new technology ($$).
- Core classes required and content is strong but redoing credit and contact hours is affecting student interest. Students are finding it hard to focus on the too many topics.
- CAE class needs some work on CAD die simulation.
- Some fundamental information is not consistent (i.e. Dimensioning, tooling standards,) thought the program, making it difficult at times for the student.

10. *If you could change the CAD Drafting/Tool Design program in any way you desired, what would you do? This may include program content, materials, name, methods or configuration. Please be as open and candid as possible.*

Comments:

- A plan to ensure turnover of computers so no stations are older than 2 years.
- Need to have more real life problems to stimulate student learning.

- I would consider making the Tool Design portion part to O-4 Product and Tool Design Technology degree.
- A natural progression from first year problems to second year problems.
- Consistent plotting and dimensioning standards.
- Increase the credit hours for the major Design classes (Injection Mold, and Die Design)
- Change the MFGT 150/250 class to one class (different objectives), then add an automation class or Computer Information class (networking, systems, OS, etc)

11. What resources would be necessary to change the program in the manner that you have listed above?

Comments:
- Money, equipment, partnership with industry
- Very little resources would be needed.
- Planning the objectives, and making the changes.

12. Rate the present resources and equipment.

	Excellent	Above Average	Average	Below Average
Classrooms	1	1	2	☐
Drafting Boards	☐	☐	2	2
~~Drafting Machines~~	☐	☐	☐	☐
Seating	1	2	1	☐
CAD hardware	1	1	2	☐
Computer Lecture Stations	☐	3	1	☐
Plotters, Printers	☐	2	1	1
CAD Software	☐	1	3	☐
CAE Software (one no reply)	☐	1	2	☐

13. Do you think that the CDTD program does enough recruiting?

Comments:
- The program needs help with recruiting materials and delivery. H.S. faculty need to be given our degree information.
- No There is never enough.
- NO!

14. How much time should each faculty member spend on high school recruiting, away from Ferris?

Comments:
- 12 schools per year. Either bring to campus or visit their school.
- It is very difficult to make H.S. visits. It takes away from the reason we teach, answer: 1 or two per year.
- Bring more H.S. and Career Center faculty to Ferris and help them see the value in the CAD Drafting Tool Design program. They make the best recruiters.
- I would like students to come to Ferris. We have something to show now!

15. Please comment on the resources that impact the CDTD program.

Comments:
The College of Technology or the University has never worked with the CDTD program to develop a resource allocation plan. It is critical for the CDTD program to have allocated funds for computer and software upgrades and equipment repair i.e. Rapid Prototyping, scanning equipment, printers, plotters, instructional equipment (projectors, white boards). It is also unclear on how to obtaining funds for training and conferences without having to find a new path or way to get funding. I feel we have been very lucky in the past couple of years to receive some funding for special projects. I think that the only reason we received this special funding was due to efforts on the part of the program faculty. We have never seen a plan for the replacement of computers, lab furniture, and special equipment. I feel that there should be a complete budget reallocation in the College of Technology for departments based on need instead of past spending and historical data. The CDTD budget has been based on past historical information and technologies have changed. The CAD Drafting Tool Design program has gone from using paper and pencil as the primary design tool to highly sophisticated computers and design equipment. In order for the CDTD program to stay on the cutting edge of technology, we need to train students on specialized equipment that is being used in industry. The ability to pursue grants would be made much easier if we had the ability to obtain matching funds when applying for a grant.

Having very little funding, we are always operating in a catch up mode and buying second class equipment instead of being proactive to establish a first class facility. We have the ability to place Ferris State University in the spotlight at the State and National level. Swan 502, 501A, 501B needs new carpeting and lighting. These labs are also in need of permanent air conditioners (not window models) to assist in maintaining equipment housed in these rooms. Swan 503 is in need of new furniture, especially quality chairs that will hold up in the classroom.

The CDTD program has never had the benefit of budget reallocation within the College of Technology. Budgeting procedures never include "direct" input by the faculty. Many programs have, by virtue of the current chair structure, a single voice to address concerns

of their program. The financial resources for the program are not structured, consistent, or provide for future planning on a large scale.

The secretarial support for the CDTD program has had a negative impact on various projects. Recruiting, reports, surveys, and other similar projects have been difficult to do in an efficient manner. The current chair/department system of sharing a secretary is not working. We currently have five programs being served by one secretary.

16. What are your perceptions of Admissions and related activities and policies?

Comments:
I feel the admissions standards are improving. I feel that math and English/Reading ACT's should be 17 or higher. We have more support now with an admissions person in the College of Technology.

I feel our admissions standards are helping our program bring in better students. The CDTD program is a fairly intense program and requires adequate skills in math and scientific reasoning. I do feel that we need to allow under prepared students the opportunity to succeed and should be placed in the University College to hone their skills prior to program entry. This will aid in retention rates and should raise potential student opinion of the program knowing we have a high program completion rate.

The Admissions department should make efforts on a regular basis to keep abreast of changes in the technology and "speak the language" of the program to prospective students.

Admissions should host program specific visit days. Program visit days would include the mailings to faculty and students of each program that is similar to the Ferris program i.e. High School Drafting programs for CAD Drafting and Tool Design.

17. What are you thoughts on the degree of commitment by the administration?

Comments:
Communication is lacking from the top down especially in the COT. Our administrators in the COT are not good listeners or communicators of information. It is very frustrating to be put off and not acknowledged when seeking information and help. This is not the case at the department level but department heads hands are tied and are not getting the support they need.

The administration has been very supportive of our efforts to enhance our facilities and equipment. But we don't have a plan to maintain it.

Summer camps and recruiting ideas are not given enough supported or given recognition. Many people work hard to enhance and improve the curriculum, facilities and college with very little support.

I feel that at the department level we have great commitment with our current department head Chuck Drake. It has been extremely difficult to communicate at the Deans level because of the continuous change and transition. We haven't had leadership that helped promote and direct good ideas and individual effort. I have only great things to say about our President's office staff, as without them our program would have missed out on some special opportunities in the past two years. I also feel that we need far better secretarial support at the department level. It is ridiculous to have one secretary for such a large department. We see many other departments with less students and faculty, but have more secretaries and staff.

Upper administration has a good handle on our program and has made many personal visits to showcase our rapid prototyping facility to outside visitors. Upper administration has helped us to obtain some of our new equipment and technology.

The interference of upper administration on program specific web pages is very offending to me! Program faculty have made the effort to create Ferris web pages for the benefit of the program and Ferris as a whole. The administration then makes a decision to "oversee" the content and makes it difficult to do the pages. I thought I was working as a professional in a professional environment! Program specific web pages (not the general pages developed by the Ferris web team) are important, and the administration should make plans to encourage and support this important tool for recruiting students, not stifle the efforts.

While the department chair system is not an equitable representative system, our department chair has worked very hard to keep us informed and to make sure that required information is passed from faculty and administration and vice versa. The changes in department structures and support staff have never been evaluated as to the benefits or negative impact on the programs. Similarly, many potential students first impression of our program is met in a crowded, out-of-date, and many times not functioning front office.

SECTION 6

ADVISORY COMMITTEE PERCEPTIONS

A. PROGRAM TASK

Advisory Committee Perceptions: 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 and adversely), and other relevant information. Recommendations for improvement must be sought from the group.

B. BACKGROUND INFORMATION

The CDTD program maintains an active Industrial Advisory Committee (IAC). The committee is comprised of individuals from the tool design and product design field. The faculty and students meet with the advisory committee on an annual basis. The advisory committee members are invited on campus and we have traveled to the advisory committee's facilities to obtain a clearer understanding of what industry needs from the CDTD graduates. Our meetings on campus provide the committee members an opportunity to tour the program facilities, evaluate equipment and curriculum content. The committee is also given the opportunity to meet with the program students without the faculty present. The meeting gives industry advisors a chance to hear student positive and negative concerns about the program. It also gives industry representatives a chance to share their educational expectations and advise the faculty on the tool design industry.

C. INDUSTRIAL ADVISORY COMMITTEE MEETING RESULTS

Some of the most recent suggestions from the IAC have been incorporated into the program. The CDTD program has established a tool design lab that emulates the industry environment with individual design work areas. The design lab provides the sophomores a realistic work environment with sophisticate equipment design tools. It is imperative that the CDTD program have the resources to maintain this facility. The curriculum was also changed, with suggestions from the advisory committee, with the addition of a tool detailing class. The tool detailing class gives freshman a chance to experience what tool design is. Students become familiar with molds, dies, jigs, fixtures and

terminology used in design. The class also provides more computer design time with the detailing of tool components. The Industrial Advisory Committee supports the program with curriculum advise and periodically hires our graduates but very few provide resources for our program growth.

C. SURVEY RESULTS
(See the Advisory Committee Summary of Data in Appendix F)

The 11 IAC members were sent surveys. A total 5 IAC members responded to the survey. A follow-up call was made to all members with some additional responses being sent with these being reflected in the total. The following results are based on a disappointing response of 45% of the committee. The IAC feels it is important to meet with the faculty on at least an annual basis. They feel their input and suggestion are taken seriously by the CDTD faculty. The committee member survey indicates support for our current program direction. They feel the curriculum is relevant and current. They feel the CAD design software training is more important the drawing board skills. They especially feel the solid modeling is important for the students to know. The IAC also feels that fundamental, basic projection and visualization skills are necessary.

The committee indicated strengths and weaknesses to be:

Strengths:
- The ability to change and move with industry needs
- The students know the basics
- Up to date technology and labs
- Tool design and CAD exposure

Weaknesses:
- Make students aware of global competition.
- Using the latest CAD equipment. Catia, UG, Pro-E etc.
- Training in product feasibility, and economics.

Suggestions:
- Introduce the global competition and economics.
- Introduce Manufacturing processes and feasibility of design manufacturing.
- A four year tool engineering degree.
- Add a forming simulation software module.

These points and suggestions are clear and relevant but it isn't always possible to add more to the curriculum mix. It is difficult to introduce more material and maintain the quality of the student instruction and skills. The IAC suggestions and input is always considered and evaluated to remain current with industry needs.

SECTION 7

LABOR MARKET ANALYSIS

A. PROGRAM TASK

Labor Mark Demand Analysis: This information is provided to describe the Marketability of future graduates in the Technical Drafting Tool Design/CAD Drafting Tool Design program. Reports from the Department of labor and industry are excellent indicators for forecasting demands for graduates.

A problem for the CAD Drafting Tool Design Program is finding a specific database for our career field. The CDTD profession overlaps other categories and statistics. Some of the most applicable categories are typically:

Mechanical Drafters- Normally an A.A.S. degree in CAD drafting skills and detailing.

Industrial and Mechanical Engineering-Normally a B.S. degree in Mechanical or Industrial Design with emphasis in mechanical design and manufacturing processes.

The CDTD degree requires specific skills, training and knowledge in metal stamping and plastics industry along with drafting standards and CAD skills. Because of the unique nature of the program, analysis was done on a number of Standard Occupational Classifications (SOC codes). The analysis was done at both the state and national level.

B. STATE OF MICHIGAN LABOR MARKET ANALYSIS

The Michigan Department of Career Development (MDCD) and the U.S. Bureau of Labor Statistics (BLS) provide data on the job outlook and anticipated wages of tool design graduates. This information is based on SOC code job titles and descriptions that best fit the tool design field. The employment outlook Mechanical Drafter from 2000 to 2010 indicates an annual average growth of a little over 5%. The occupation of Industrial or Mechanical Engineer indicates an average growth of 11% over the same period. These occupations provide a job path in tool engineering and design.

SOC Classification	Annual Job Growth 2000-2010	
17-3013 Mechanical Drafters	410 Jobs	5.2%
17-3026 Industrial Engineers	270 Jobs	10.7%
17-3027 Mechanical Engineers	370 Jobs	10.7%

The U.S. Bureau of Labor Statistics provides data, for the state of Michigan, that indicates estimated mean wages for Mechanical Drafters at $50,180 Industrial Engineers at $64,680 Material Engineers at $58,830 and Mechanical Engineers at $62,780.

Job opportunities, for tool design and related jobs, in the State of Michigan remain high. A recent survey of job opportunities in the Detroit Free Press and The Grand Rapids Press indicated numerous job openings in the Tool Design and Tool Engineering field. Some of the job titles found were Tooling Engineer, Tooling Design Engineer, Process Engineer, Product Development-Process Engineer and AutoCAD Designer. Resent job listing for the above job titles may be found in Appendix G.

C. NATIONAL LABOR MARKET ANALYSIS

The Bureau of Labor Statistics of the U.S. Department of Labor provided three Standard Occupational Classifications that best fit the Tool Design industry and employment opportunities. These categories were Mechanical Drafters, Mechanical Engineers, and Industrial Engineers. While many of the duties and skills required by Mechanical and Industrial Engineers are outside the scope and requirements of Tooling Engineers, a knowledge of processes and tooling is applied. Descriptions of Mechanical Drafters, Industrial Engineers and Mechanical Engineer categories are provided in appendix G.

Mechanical Drafters: About 69,150 Mechanical Drafter jobs were available nationally in 2001. These jobs consisted of detailing and design of machinery and mechanical devices. The average hourly wage was $20.07 with a mean annual wage of $41,750.

Mechanical Engineers: About 204,310 Mechanical Engineer jobs were available nationally in 2001. These jobs consisted of planning and designing tools, machines and other mechanically functioning equipment. The average hourly wage was $30.54 with a mean annual wage of $63,530.

Industrial Engineers: About 161,540 jobs were available nationally in 2001. These jobs consisted of Designing, developing systems for managing industrial production processes. This job also consists of Process Engineering skills for the manufacturing of plastic and stamped parts. The average hourly wage was $29.78 with a mean annual wage of $61,940.

D. FSU CAD DRAFTING AND TOOL DESIGN PLACEMENT OFFICE ANALYSIS

A review of the placement office data indicates 100% placement of the students seeking employment. The students that seek employment, within the tool design field, have found the profession challenging and financially rewarding (see the alumni comments appendix B). Many of the students in the CAD Drafting Tool Design program continue on for a bachelor degree after completing AAS degree. This may range from 60% to 75% of our graduates continue on for a bachelor degree. The combination of CAD and tool design gives the students an excellent blend of skills and knowledge that is needed in industry. A review of the comments and reactions in the alumni survey indicates, for some alumni, the AAS degree in tool design was the foundation for their future employment. Tool design is the foundation for all manufacturing processes. A tool is required for stamping processes, machining processes and plastics manufacturing industry. An understanding of tool design and how components and products are made produces a well-rounded and capable product designer, manufacturing engineer and mechanical engineer. The majority of the students who continue their education choose one of the following Bachelor of Science degree paths; Occupational Education, Product Design Engineering Technology, Manufacturing Engineering Technology or Plastics Engineering Technology.

The most recent data obtained on graduate follow-up and placement profiles for CAD Drafting Tool Design or Technical Drafting Tool Design students is from 1998-1999 and 2000-2001 surveys. (See charts in Appendix G)

Summary

1998-99 placement profile
Technical Drafting Tool Design graduates

1. 25 total graduates with 16 responding
2. 9 continuing on with their education with 3 of the 9 employed while continuing their education.
3. 7 of the 16 respondents became employed only.
4. Salary ranges from $10,000 low to $48,000 high with an average starting salary of $27000.

Summary

2000-2001 Graduate Follow-Up Survey
CAD Drafting Tool Design Technology

1. 20 graduates with 13 responding
2. 100% placement with 13 students employed or continuing education.

Data and information supplied by Ferris State University Career Services and Institutional Research.

OCCUPATIONAL EMPLOYMENT FORECASTS
MICHIGAN DEPARTMENT OF CAREER DEVELOPMENT
2000 - 2010
(By SOC Code)

SOC CODE	OCCUPATION	EMPLOYMENT 2000	EMPLOYMENT 2010	CHANGE LEVEL	CHANGE %	ANNUAL AVERAGE OPENINGS TOTAL	GROWTH	REPLACEMENT
17-2199	Engineers, All Other	51,510	48,630	-2,880	-5.6	1,027	0	1,027
17-3011	Architectural and Civil Drafters	2,500	2,850	350	14.0	111	35	76
17-3012	Electrical & Electronics Drafters	1,230	1,550	320	26.3	69	32	37
17-3013	Mechanical Drafters	7,980	8,390	410	5.2	283	42	241
17-3021	Aerospace Engineering & Operations Techn	510	520	10	2.0	11	1	10
17-3022	Civil Engineering Technicians	1,720	1,920	200	11.5	55	20	35
17-3023	Electrical/Electronic Engnr Technicians	5,580	5,840	260	4.7	139	26	113
17-3024	Electro-Mechanical Technicians	860	960	100	11.1	27	10	18
17-3025	Environmental Engineering Technicians	610	740	130	20.2	25	12	12
17-3026	Industrial Engineering Technicians	2,530	2,800	270	10.7	78	27	51
17-3027	Mechanical Engineering Technicians	3,370	3,740	370	10.7	104	36	68
17-3029	Engineering Technicians, Ex Drafters, AO	320	290	-30	-10.9	7	0	7
17-3031	Surveying and Mapping Technicians	1,850	2,250	400	21.3	99	39	60
17-3099	Drafters/Engineerg/Mapping Technician, AO	23,940	26,580	2,640	11.0	782	264	518

U.S. Bureau of Labor Statistics 2001

Mechanical Drafters and Related Occupations

State of Michigan Employment Estimate and Mean Wage for the Occupation:

SOC Code:	Employed	Hourly Wage	Mean Wage	RSE
17-3013 Mechanical Drafters	6,130	$22.07	$50,180	5.5%
17-2112 Industrial Engineers	12,730	$31.03	$64,680	0.8%
17-2141 Mechanical Engineers	14,350	$29.72	$62,780	1.2%

2001 National Occupational Employment and Wage Estimates

17-3013 Mechanical Drafters

Prepare detailed working diagrams of machinery and mechanical devices, including dimensions, fastening methods, and other engineering information.

2001 National Occupational Employment and Wage Estimates

These estimates are calculated with data collected from employers in all industry divisions in metropolitan and non-metropolitan areas in every State and the District of Columbia. These and other data elements, including the 10th, 25th, 75th, and 90th percentile wages are available in the downloadable excel files. Estimates do not include self-employed workers.

Employment estimate and mean wage estimates for this occupation:

		RSE (3)
Employment (1)	69,150	2.3 %
Mean hourly wage	$20.07	0.8 %
Mean annual wage (2)	$41,750	0.8 %

Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$12.12	$15.04	$19.05	$24.20	$29.80
Annual Wage (2)	$25,220	$31,290	$39,610	$50,350	$61,990

2001 National Occupational Employment and Wage Estimates

17-2141 Mechanical Engineers

Perform engineering duties in planning and designing tools, engines, machines, and other mechanically functioning equipment. Oversee installation, operation, maintenance, and repair of such equipment as centralized heat, gas, water, and steam systems.

2001 National Occupational Employment and Wage Estimates

These estimates are calculated with data collected from employers in all industry divisions in metropolitan and non-metropolitan areas in every State and the District of Columbia. These and other data elements, including the 10th, 25th, 75th, and 90th percentile wages are available in the downloadable excel files. Estimates do not include self-employed workers.

Employment estimate and mean wage estimates for this occupation:

		RSE (3)
Employment (1)	204,310	2.5 %
Mean hourly wage	$30.54	0.7 %
Mean annual wage (2)	$63,530	0.7 %

Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$19.54	$23.90	$29.54	$36.65	$44.12
Annual Wage (2)	$40,640	$49,720	$61,440	$76,230	$91,770

2001 National Occupational Employment and Wage Estimates

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).

2001 National Occupational Employment and Wage Estimates

These estimates are calculated with data collected from employers in all industry divisions in metropolitan and non-metropolitan areas in every State and the District of Columbia. These and other data elements, including the 10th, 25th, 75th, and 90th percentile wages are available in the downloadable excel files. Estimates do not include self-employed workers.

Employment estimate and mean wage estimates for this occupation:

		RSE (3)
Employment (1)	161,540	1.9 %
Mean hourly wage	$29.78	0.4 %
Mean annual wage (2)	$61,940	0.4 %

Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$19.13	$23.72	$29.22	$35.25	$42.66
Annual Wage (2)	$39,790	$49,340	$60,770	$73,320	$88,730

SECTION 8

EVALUATION OF FACILITIES AND EQUIPMENT

A. PROGRAM TASK

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.

This analysis of facilities and equipment was developed after careful review of the responses to the faculty, advisory committee, and industry surveys conducted for the review of this program. The criticisms, concerns, comments, reponses, and recommendations of the respondents to the survey were given top priority in determining the state of the CAD Drafting Tool Design program's facilities, equipment and needs of technologies to continue a relevant program of instruction. Many of these needs have been previously identified in Unit Action Plans and/or minor capital improvement recommendations and some have been introduced here for the first time based on the responses to the survey. Our goal is to create a pleasant and professional environment for our students.

B. SUMMARY OF FACILITIES AND EQUIPMENT:

1. Classrooms and Laboratories:

   Most of the respondents rated the facilities as good to excellent with the few exceptions identified below. All respondents gave high praise for the new lab in Swan 504, Advanced Tool Design Lab.

2. Classrooms:

   The new lab in Swan 504 was rated impressive and should be expanded into rooms 502 and 503. Our facilities have greatly improved in the past three years due to faculty driven initiatives, however, our facility is not at the "State of Industry."

3. Heating, Ventilation and Air Conditioning:

   A few responses indicated overheating and stuffiness as problems. Most of the heat problems were either thermostat related or students turning fans on and the univents off because they were too noisy. A possible improvement would be to have the existing fans controllable by faculty. Air conditioning is needed or replaced in Swan 501/502/503.

4. Lighting:

   Lighting is a problem in Swan 502 and needs to be checked. We need professional track lights in our hallway to light our displays.

5. Drafting Boards:

   Some of the respondents made negative comments on the condition of the drafting boards and related equipment. Swan 502 needs drafting table tops replaced and drawers/pencil trays painted or boards totally replaced. Straight edges also need replacement. They look old and in rough shape.

6. Seating:

   Seating in Swan 503 is very worn and damaged and should be replaced.

7. Present Equipment:

   There was some criticism of computers, printers/plotters, and computer software.

8. Computer Hardware:

   We need to have a strategic and consistent plan to replace outdated computers in the two main computer labs, Swan 503/504. The new design lab, Swan 504, is in good shape at this time but plans need to be made to upgrade Swan 503. A plan needs to be developed to maintain current equipment and upgrades need to be made to support more advanced software. We need to provide students with the latest innovations, software, hardware, and techniques being used in industry.

9. Computer Software

Software needs to be investigated. We need to have a higher level industrial CAD package that will prepare our students for higher level positions.

10. Printers/Plotters:

A new plotter is needed in our Advanced Tool Design lab as well as a color printer.

C: AVAILABILITY OF TECHNOLOGIES:

This section of the analysis is based on the technologies recommended by respondents to the surveys.

1. Parametric and Solid CAD Models:

Respondents recommended an increase, or even total use, of parametric solids models. This could be accomplished by updating the computers and using more powerful CAD software.

2. Rapid Prototyping:

Since our last APR report we added the "FSU Rapid Prototyping Center." We need to have a budget that will support supplies and equipment replacement. Many of the respondents recommended efforts to increase and expand our rapid prototyping. Efforts to work with high school students greatly expose Ferris to the community.

3. Multi-media Presentations:

All the faculty in our program have the required skills required to create multi-media presentations and/or preprogrammed compact discs which contain lecture presentations on coursework. A computer lecture section with overhead projector in each classroom with multi-spin CD ROM would allow faculty to avail this technology.

4. Demonstration Equipment:

We need better teaching aids and equipment to demonstrate complex concepts to our students.

SECTION 9

CURRICULUM REVIEW

A. PROGRAM TASK

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.

The CAD Drafting Tool Design Technology curriculum has seen some changes during the past decade. Some of the first changes were due to the switch from quarters to semesters. The change required the program to combine course content and change credit hour requirements. These changes were addressed in the previous Academic Program Review document in 1997-1998. Other changes were implemented after a thorough evaluation and discussion with industry representatives and faculty input. One significant change was the change in program name. The Technical Drafting Tool Design program name was changed to CAD Drafting and Tool Design Technology (CDTD). Some of the curriculum changes were implemented because of new technology and industry applications and other changes were industry advisory committee suggestions. The most recent change in curriculum, since the last APR, was implemented during the 2002 – 2003 academic year. The changes made during the 2002-2003 academic year are summarized below.

1. CDTD-112 Introduction to CAD and CDTD-122 advanced CAD were increased in credit hours and contact. The CAD classes changed from 3 credits to 4 credits. This increased the contact hours in the class from 5 hours to 8 hours per week.
2. CDTD-111 Drafting Fundamentals was changed from 5 credits to 4 credits and contact hours were reduced by three hours per week.
3. CDTD-121 Product Detailing and Advanced Tolerancing change credit hours from 5 credits to three credits with contact hours changing from 8 hours per week to 5 hours.
4. Created a new course CDTD-130 Tool Detailing. This class provides Freshman students with an opportunity to learn about tool design components and the applied terminology.

The curriculum changes were made largely due to industries increased use of CAD for tool design. The CDTD students need to apply industry tools during their educational experience. Computers are replacing traditional board drawings.

This has made ability to sketch ideas and concepts more important than board drawing. Fundamental sketching concepts and drawing standards are an important skill for our students to know and apply. These skills are now being taught in the CDTD-111 Drafting Fundamentals course.

The addition of the CDTD Rapid Prototyping Center, in 2000, has provided the CDTD program with State and National recognition. During the 1999/2000 school year the CDTD faculty obtained a Stratasys rapid prototyping machine. The machine allows students to take CAD solid models they have created and produce the part from polymer in the matter of hours. The CDTD faculty incorporated the rapid prototyping (RP) technology into the curriculum. Students in the Product Design Engineering Technology program and other programs within the College of Technology are using the Rapid Prototyping Center. Students have become more aware of how CAD can be used as a fit, function and design application tool. The program was able to increase the size of the RP center with the acquisition of two new RP machines for the 2002 – 2003 academic year. The addition of the new technology has increased the visibility of the CDTD program at the State and National level. The CDTD faculty presented the rapid prototyping technology and how we are using it at state and national conferences. We presented at the National Tech Prep Conference in Dallas and Cincinnati with presentations entitled: Turning Students On to Design Careers and Post-Secondary Education through CAD and Rapid Prototyping and Linking Secondary and Post Secondary CAD programs through Rapid Prototyping. We also presented at the Michigan State Governors Conference with presentations entitled: Linking Secondary and Post Secondary CAD programs through Rapid Prototyping and Creating an Interest in Technology through a Summer Technology Academy. The CDTD program has created an outreach program that allows high schools and career centers to send CAD data to our RP center. The CAD data is then used to create parts for students.

B. SUMMARY OF CURRICULUM FROM EMPLOYER

Industry evaluation of the program and curriculum indicates a continued support for teaching the basic drafting, CAD and design skills needed in today's industry. Industry requires that students have an understanding of CAD and how it is applied in the design field. Training in two-dimensional computer aided drafting and employers desire three dimensional solid modeling applications. A high priority in the exposure to materials and manufacturing processes was indicated by the employer survey. Many employers indicated less need for advanced computer application such as computer aided engineering and computer aided design software.

C. GRADUATE FOLLOW-UP SURVEY AND CURRENT STUDENT SUMMARY

The curriculum and facilities have changed over the years. The results of the Graduate Follow-up Survey could provide some misleading information depending on how it is interpreted. Much of the technology has changed since many of the graduates attended FSU. Keeping this in mind, some of the CAD questions provide confusing results. By comparison, our current students rate the need for computer skills at a high priority. Many of the CDTD graduates indicated that fundamentals of drafting and projection skills are somewhat or greatly important. The graduates find the degree useful and relevant for today's industry. By comparison, our current students find the advanced software and hardware applications very useful and interesting. One area our current students have indicated to be a problem is finding the classes they need with the current course configuration. We have added a new course in the second semester of the CDTD program. This requires six classes for the student and scheduling has become more difficult.

D. FACULTY SUMMARY OF CURRICULUM:

CDTD students are continually evaluated through the use of tests, graphic assignments, design applications and design presentations. The students find the curriculum and assignments demanding yet rewarding when successfully completed. The program recently made some changes to the program courses and course content. The changes were based on industry recommendations and faculty evaluation. The decision to change credit hours and add a new class also changed the scheduling for freshman students. The addition of one new class created an increase in student learning activities and involvement in the new class. Some students indicated that it is difficult maintain their studies and learning ability with such a demanding schedule. Another faculty concern is their ability to remain current with industry and future developments. Training of faculty will continue to be of concern for the CDTD program. The faculty desire is to continue keeping course content and technology current with a vision toward future design methods. New software is now available that reduces the design time for tool design. CDTD faculty are hoping to incorporate the design and tool design software applications into the program. The addition of new software will require additional funds be directed to the acquisition and annual licensing of the software titles. It is our concern that funds are made available to help with this problem.

15590 Colfax Cv.
Big Rapids, Mi. 49307
eldridgr@ferris.edu

Richard F. Eldridge

Objective

My objective is to teach drafting, computer aided design (CAD), product design and tooling skills at the community college or university level.

Experience

2002-1986 Ferris State University Big Rapids, Mi.

Associate Professor

- Responsible for teaching drafting fundamentals, CAD, product detailing and tooling principles.
- Taught 3-D modeling, wire frame, surfacing, solid modeling, and parametric technology. Also taught the tool design and die design portions of the program.
- Worked with rapid prototyping techniques and assisted students in developing data for prototyping.
- Certified Geometric Dimensioning and tolerancing Professional, Technologists Level Certification.

1986-1977 Keiper Recaro Battle Creek, Mi.

Project Manager

- Managed projects with General Motors and Van Conversion Companies
- Designed seat recliners for OEM new product and after market van conversions.
- Directly interfaced with quality control, tooling, and production.
- Patent submitted for a remote ratchet seat recliner Case N. 2263 serial No. 615,782

1977-1974

Industrial Arts Instructor

- Taught high school small engines, woodworking, automotive, and electronics.
- Established a small engines curriculum.
- Worked with the senior class as an advisor.

1972-1970

Teacher at National Electronics Institute (Denver Institute of Technology)

- Taught introductory drafting skills, descriptive geometry, illustration, and electronic schematic diagram creation.
- Developed course on schematic diagramming for electronics.

Education

1994 Ferris State University Big Rapids, Mi.

- Masters, Occupational Education
- Highest Honors, 4.0

1974 University of Northern Colorado Greeley Colorado

- B.A. Industrial Arts Education

1962-1965 Kellogg Community College Battle Creek, Mi.

- AAS Drafting

13868 Ruby Lane
Big Rapids, MI 49307
(231) 796-5435

EMPLOYMENT OBJECTIVE:

An academic position that would provide growth to an existing program to keep pace with industrial changes, particularly in CAD/CAM, CMM, Rapid Prototyping, design, and model prototyping, or a similar position in industry.

PERSONAL INFORMATION: Birth date: 10/10/51 Height: 6' 0" Health: Excellent Weight: 205 lbs.
Marital Status: Married, Two children U .S. Citizen

EDUCATION:

FERRIS STATE UNIVERSITY, *Big Rapids, Michigan*
M.S. Occupational Education, August 1988
B.S. Trade Technical Teacher Education, November 1978 Special Emphasis: Manufacturing Related
AA.S. Technical Drafting and Tool Design, May 1977

WORK EXPERIENCE:

1978 - Present:

I am an ***Independent Consultant*** for Tool, Die and Injection Mold Design Design, CAD,Graphics, and Rapid Prototyping.

1996 - Present:

I am a **Service Provider** for the Society of Manufacturing Engineers (SME)

1996 - Present

FERRIS STATE UNIVERSITY, *Big Rapids, Michigan*
Position: **Professor CAD Drafting and Tool Design**
Major responsibilities include:
Teaching, Developing courses in Injection Mold Design Including 3D CAD Solids, Blue Print Reading, Engineering Graphics, Basic AutoCad, Advanced AutoCad, Solid Modeling, Parametric Solid Modeling (Mechanical Desktop), Product Design CAD

1988 – Present

Subject Matter Expert, and Master Examiner for NOCTI (The National Occupational Competency Testing Institute)

1984 -1995

FERRIS STATE UNIVERSITY, *Big Rapids, Michigan*
Position: **CAD SPECIALIST / ASSOCIATE PROFESSOR**
Major responsibilities include:
Systems Manager: Maintenance on ComputerVision CADDS 4x mainframe system, Cimlinc Tower and Power CIM Systems, and SUN Engineering workstations as well as PCs. Duties include TCP /IP networking, backups, installations, troubleshooting, conducting training sessions for faculty on changes to systems. Writing C programs and Unix shells for various applications, including DNC to machine controllers, CMM data to CAD, plotting, and printing.
Stereolithography Manager: Install/maintain/troubleshoot SLA-250 Rapid Prototyping System. Conducted industrial training sessions on SLA applications. Have built many complex SLA models. Instructional duties include teaching courses in Blueprint Reading, Engineering Graphics, Drafting, Introduction to Technology, Introduction to CAD, Advanced CAD including complex surfacing, model and prototyping, FEM/FEA, and Stereolithography.

1978 -1984

ACME INSTITUTE OF TECHNOLOGY, *South Rend, Indiana*
Position: **DESIGN DEPARTMENT HEAD -LEAD INSTRUCTOR**
Major projects and responsibilities included:
Meeting with the Japanese Acme School periodically to inform them of text and method of operation changes. Initiated, organized, and conducted the selling of thee Cope System franchises to the Korean government and the Grand Rapids, Michigan and Huntsville, Alabam locations, Editing, rewriting the Cope System materials and informing all associate schools of the changes. Successfully conducted the Korean instructor training sessions. Established a 36-week numerical control program including basic, Manual and Compac II programming. Responsibilities within the classroom included teaching Tool, Die, Plastics Mold Design courses (48 weeks Each). Other courses successfully taught include Algebra, Geometry, Trigonometry, Mechanical Drawing, Descriptive Geometry, Basic Computer Programming, Basic Numerical Control, Compac II, Strength of Materials, and Metallurgy.

GENERAL INFORMATION:

I enjoy most all-outdoor activities, especially skiing, camping, and water sports.
I am a member of The Society of Manufacturing Engineers (SME).

REFERENCES:

Both employment and personal references furnished upon request.

RESUME

Todd N. Rose
Phone 616 / 874-8993

PERSONAL

Birth Date:	**1-6-45**	**Married**	
Height / Weight:	**6'3" / 195**	**Children:**	**Three**
Physical Health:	**Excellent**	**U.S. Citizen**	

EDUCATION

1975	**M.S. degree in Industrial Management** **Western Michigan University**
1968	**B.S. degree in Trade Technical Education** **Ferris Sate University**
1965	**A.A.S. degree in Technical Drafting and Tool Design** **Major - Die Design** **Ferris State University**
1963	**Graduated from Ottawa Hills High School**

ADDITIONAL TRAINING

Progressive Die Design Seminar
CAD - CIMLINC, Auto-Cad, Computervision
Engineering Project Management - Westinghouse
Value Analysis - Westinghouse
Carboloy Tooling Seminar
Robotics - Unimate and GMF
Industrial Truck Design
Plant Layout and Material Handling
Electronics

PROFESSIONAL ORGANIZATIONS

Society of Manufacturing Engineers
Society of Body Engineers

PATENTS

4,719,727

4,850,176

INDUSTRIAL EXPERIENCE

1988 - Present **Associate Professor - Manufacturing Engineering Technologies Department**
Ferris State University, Big Rapids, Michigan

Major duties: Teach technical drafting, CAD, descriptive geometry, product, tool, and die design.

Summer positions: Prince Corp., Diesel Tech., Ridgeview Stamping, Precision Metalforming Association, Capitol Engineering.

1982 - 1988 **Engineering Manager - C-Tec Inc , Grand Rapids, Michigan**

Products: Access Flooring for computer rooms and offices

Major duties: Manage and direct product design / devolopment, manufacturing engineering and facilities

Major completions:
- **Directed task force to relocate and start up new company**
- **Implemented several new product designs**
- **Created major cost savings through design and manufacturing**
- **Installed a welding robot and stacking robot**

1979 - 1982 **Manufacturing Engineer - Westinghouse Electric, Grand Rapids, Michigan**

Products: Open Office Systems

Major duties: Planned and implemented plant rearrangement projects; economic justification for capital expenditures; cost reductions programs; identify, develop and recommend new method improvements. Also, planning, purchasing, and implentation of equipment for storage, work flow and material handling of raw and finished goods.

Major completions:
- **Improved productivity capacity 100% on flooring product line**
- **Implement JIT program**
- **Improved quality of flooring products**
- **Installed major receiving / shipping converyor system**
- **Installed hi-rise warehousing**
- **In charge of product relocation to C-Tec**

1969 - 1982 **Instructor (part time) - National Apprenticeship Program**
Kellogg Community College, Battle Creek, Michigan

Major Duties: Teach technical drafting, blueprint reading and tool design for apprentice tool-die, machine repair and machinists.

1976 - 1979 **Project Engineer - Kelvinator-White Consolidated, Grand Rapids, Mich.**

Products: Consumer products - electric ranges

Major duties: Managed projects - design, development and testing.

Major completions:
- **Modular countertop range**
- **Tri-level range with microwave oven**
- **Glass top countertop range**

1974 - 1975 **Supervisor - Tool Design - Rockwell International, Battle Creek, Michigan**

Products: Off-Highway components - brakes, special speed reducers, and mass transit units.

Major duties: Supervised plant start-up, tooling, tool design, gaging, processing and cost estimating.

Major completions:
- **Plant start-up**
- **Design and implement disk brake caliper machining center**

1971 - 1974 **Methods Engineer - Eaton Engine Component Div., Battle Creek, Michigan**

Products: Automotive and truck internal combustion engine valves

Major duties: Co-ordinate machine set-ups, improve production methods, economic justification for capital equipment purchases, tooling justification and procurement, work standards and design.

Major completion:
- **Design machine to combine five machining operations into one.**

1968 - 1971 **Designer Draftsman - Clark Equipment Co., Battle Creek, Michigan**

Products: Industrial fork-lift trucks

Major duties: Design, development, testing, proto-type, tooling and production follow-up for electric fork- lift trucks.

Major completion:
- **Development of new 6000-8000 lb. electric rider trucks**

1966 - 1967 **Die Designer - Kirsch Company , Sturgis, Michigan**

Products: Drapery Hardware

Major duties: Design progressive dies for drapery hardware

Daniel C. Wanink

6297 Hickory Drive
Big Rapids, Michigan 49307
Telephone: (231) 592-4961
E-mail:WANINKD@ferris.edu

EDUCATION

Bachelor of Science Degree Technical Education **Ferris State University,** Big Rapids, MI 49307 (May 1997) *Overall G.P.A.*= 3.43

- *Concentration on the Principles of Career and Technical Education*

General Science Teaching Minor **Ferris State University,** Big Rapids, MI 49307 (May 1997)

- *Concentration on Earth Sciences*

Associate Degree of Applied Science in Technical Drafting and Tool Design **Ferris State University,** Big Rapids, MI 49307 (May 1994)

- *Concentration on Mold, Die, Jig & Fixture Design, and CAD*

WORK EXPERIENCE

9-97 to Present *Assistant Professor* **Ferris State University**, Big Rapids, MI

5-98 to 8-00 *Manufacturing Engineering Intern* **Medtronic/DLP Inc.**, Grand Rapids, MI

Responsibilities include design, building, and testing of fixtures for medical product assembly.
Created documentation for training, operating procedures, and maintenance for fixtures and use of laser for a manufacturing process.

8-97 to Present *Industrial Trainer* **Technology Transfer Center** (F.S.U.), Big Rapids, MI

10-97 to Present *Test Administrator* **Occupational Research and Assessment Center**
Administering of MOCAC Certification Exam for Drafting Occupations.

6-97 to 8-97 *Contractor's Assistant* **Ed Kuula Construction**, Ironwood, MI

9-96 to 5-97 *Adjunct Faculty* **Ferris State University**, Big Rapids, MI

5-95 to 8-96 *Injection Mold Designer* **Everson Tool & Machine Ltd.**, Ironwood, MI
Responsible for the design and detailing of precision injection molds.

SECTION 10

ENROLLMENT TRENDS

A. PROGRAM TASK

Enrollment Trends: This task is to identify program enrollment trends and data over the past five years.

The CAD Drafting Tool Design program started enrolling students into the program over fifty years ago. The program was then known as the Technical Drafting Tool Design Program in 2000/01 the name was changed to CAD Drafting Tool Design Technology. The program has always been in high demand due to the hands on graphic applications of the program. The program strives to maintain and increase enrollment. The retention rate is consistently 75% to 80% with the majority of those students transferring into another degree program. One significant accomplishment is the fall 2003 freshmen enrollment stands at 48 students and 31 sophomores. This is exciting for the faculty. One area of immediate interest is the number of students expected to transfer into a baccalaureate degree at FSU in 2004.

The following data indicates the number of 2003/2004 Sophomores expecting to transfer into a baccalaureate degree program:

Product Design Engineering Technology:	21
Education:	9
Manufacturing Engineering Technology:	4
Undecided:	4
Engineering:	1
Plastics Engineering Technology:	1

(Data taken from Student Evaluation of Instruction Survey)

To help with enrollment, the program has developed CAD summer camps for high school students, distributed posters, and provides tours and visits to high schools and career centers. The program has also presented at the National Technical Preparation Conference and the State of Michigan Governors Conference for the past two years. A history of programs enrollment relative to the College of Technology and the University for the past five years is shown in the following table.

CDTD ENROLLMENT

	1998-99	1999-00	2000-01	2001-02	2002-03
CDTD	69	67	68	76	76
COT	2,234	2,224	2,356	2,311	2,264
FSU	9,651	9,668	9,847	10,930*	11,074*

*FSU/Kendall merge effective January 1, 2001
Fact Book 2002-03 Institutional Research and Testing Data

CDTD DEGREES CONFERRED

1998-99	1999-00	2000-01	2001-02
25	18	19	22

Fact Book 2000-03 Institutional Research and Testing Data

B. SUMMARY AND ANALYSIS OF ENROLLMENT TRENDS

The enrollment data indicates a steady and slightly higher enrollment trend for the CAD Drafting Tool Design program. The effort to increase enrollment by taking a proactive approach to our recruiting seems to be helping. The high school CAD summer camp activity along with an increase in on-campus tours and faculty visits to high schools and career centers is contributing to an increase in enrollment. The Current Student Survey questionnaire asked the following Question:

Why did you select the CAD Drafting Tool Design program?

The student responses indicate that high school and career center teachers are of significant influence on the student decision. The CDTD faculty found that Ferris State University graduates, that became teachers, play a significant role in recruiting for Ferris programs. The program faculty also found that it is important to get the prospective student and parents on campus for a tour of the University and the CAD Drafting Tool Design facilities. A face to face dialogue and interaction with the student and family gives the faculty the best chance to sell the program.

The addition of the CDTD Rapid Prototyping Center and Faro Arm digitizing device has greatly effected our recruiting effort and capability. Having leading edge technology that is being used by industry and available for our students to use has increased the interest in the CDTD program. The use of computers and advanced design applications is critical in today's industry. The CDTD program reputation, facilities and faculty skills are critical for recruiting new students. Prospective students and parents see advanced technology being taught and used by our students.

The ability to provide the education, application and skills needed by industry makes the recruiting effort much easier. It is imperative that the College of Technology and the University support computer and application technology with funding for upgrades, maintenance, training and recruiting.

ENROLLMENT BY PROGRAM
FALL SEMESTER

COLLEGE	1997/98	1998/99	1999/00	2000/01	2001/02
TECHNOLOGY					
DESIGN, MFG & GRAPHIC ARTS *					
CAD Drafting & Tool Design	0	0	0	9	0
Manufacturing Engineering Technology	41	43	46	50	0
Manufacturing Tooling Technology	68	58	65	60	0
Mechanical Engineering Technology	45	46	47	49	0
New Media Printing & Publishing	0	0	0	7	0
Plastics Engineering Technology	75	58	75	80	0
Plastics Technology	132	141	130	138	0
Pre-Manufacturing Engineer Technology	2	3	3	3	0
Pre-Manufacturing Tooling Technology	1	1	2	4	0
Pre-Mechanical Engineering Technology	6	7	5	10	0
Pre-Plastics Engineering Technology	16	9	2	7	0
Pre-Plastics Technology	13	17	19	7	0
Pre-Printing Management	0	0	0	1	0
Pre-Product Design Engineering	3	6	4	2	0
Pre-Rubber Technology	0	0	0	1	0
Pre-Technical Draft /Tool Design	2	5	4	2	0
Pre-Welding Engineering Technology	0	0	0	2	0
Pre-Welding Technology	0	2	1	6	0
Printing Management	34	33	34	25	0
Printing & Digital Graphic Imaging Technology	61	82	84	79	0
Product Design Engineering Technology	52	49	42	53	0
Rubber Engineering Technology	0	0	0	6	0
Rubber Technology	0	13	42	53	0
Technical Drafting & Tool Design	71	69	67	59	0
Technical Illustration	0	0	0	0	0
Welding Engineering Technology	43	46	55	52	0
Welding Technology	43	53	55	73	0
Welding Technology Certificate	0	1	0	1	0
On-Campus Total	**708**	**742**	**782**	**839**	**0**
OFF-CAMPUS					
Manufacturing Engineering Technology	62	60	55	57	0
Plastics Engineering Technology	3	4	2	1	0
Product Design Engineering Technology	31	26	30	33	0
Quality Engineering Technology	7	13	6	13	0
Quality Technology Certificate	2	1	0	1	0
Off-Campus Total	**105**	**104**	**93**	**105**	**0**
DEPARTMENT TOTAL	**813**	**846**	**875**	**944**	**0**

* Department reorganization effective Winter 2001

Source: Office of Institutional Research and Testing

SECTION 11

PROGRAM PRODUCTIVITY

A. PROGRAM TASK

Productivity of a program: Productivity is measured, at Ferris State University, by two methods. The first is a measure of faculty output as measured by student credit hours generated by each faculty and the specific program. The second measure is the cost of a credit hour from a specific program. The data presented is information provided from the Ferris State University Productivity Report from fall 1997 to winter 2002, Administrative Program Review document for 2002 and the Degree Program Costs 2001-2002, provided by the Office of Institutional Research. The CDTD program compares quite well with other COT Associate programs. This comparison is not presented in this document because of the difficulty in comparing programs due to variation in program equipment and organization. (See attached Methodology and Data)

B. PROGRAM PRODUCTIVITY

Program productivity measures Student Credit Hours (SCH), full time equivalent faculty (FTEF) assigned to the program and the ratio (SCH/FTEF) of credit hours generated by the faculty teaching courses with a specific prefix. CAD Drafting Tool Design courses are identified by the CDTD prefix. A high SCH/FTEF ration means the more credit hours produced by our faculty and the more desirable it is for the University.

The Program Productivity in formation presented is from the Fall 1997 to Winter 2002 and from the Administrative Program Review document for 2002.

CREDIT HOURS AND FACULTY

Academic Year	1997/98	1998/99	1999/00	2000/01	2001/02
Student Credit Hours (SCH) For CDTD courses	312	303	266	N/A	302
Full Time Eqiv. Faculty (FTEF) For CDTD courses	3.89	4.25	4.25	N/A	4.12

Notes:
1. SCH and FTE information doesn't include summer information
2. The SCH average has remained relative consistent over 5 years. The average is relative to our lab space and is limited due to the number of computers available in a lab. The program tends to have more contact hours due to lab requirements.

SCH/FTEF RATIO COMPARISONS

Academic Year	1997/98	1998/99	1999/00	2000/01	2001/02
CDTD classes	312	303	266	N/A	302
College of Technology	323	330	331	343	330

The SCH/FTEF ration for the CDTD program is slightly lower than the average for the College of Technology. 2000/01 productivity is not included due to the fact fall and winter data was not available.

C. PROGRAM COSTS 2000/2001 (Office of Institutional Research 2000/2001)

The costing procedure for instructor and program cost was accomplished by using the Ferris faculty load system data. The accuracy of the data is relative to the validity of the values used in the formula. Some of the information can be misleading and confusing when attempting to interpret the tables.

The costing system for an individual course uses a faculty member salary plus the cost of fringe benefits times the ratio of the individual course credit hours for the semester. The total instructor cost for a semester or year would be the sum of the individual instructors course costs for the semester or year. (See the following Methodology page)

CAD Drafting Tool Design Technology
Average Instructor Cost for 2000/2001:

$174.21/SCH
(See Table IV Degree Program Costing 2000-01)

CAD Drafting Tool Design AAS
Average total cost per SCH for the program
2000/2001: Care must be taken when evaluating the attached values.

$261.68/SCH
See accompanying page heading:
(Ferris State University Degree Program Costing 2000-2001)

Degree Program Costing 2000-2001
(Office of Institutional Research)

$17,532.69
(Ranked approx. 94th out of 208 programs)

D. OTHER FACTORS

The CDTD program provides a significant contribution to Ferris State University and the College of Technology because of the 2+2 Degree system. The majority of our students continue on for a baccalaureate in a number of different programs. This is not always reflected in the Productivity and Cost measurements. The CAD Drafting Tool Design Technology program requires 66 hours for graduation. A breakdown of the hours is as follows:

CDTD prefix semester hours:	37
Other College of Technology courses:	8
Other FSU semester hours	21

This shows that each CDTD student who continues on will provide semester hour contributions to other programs and colleges at the University. The presence of high productivity general courses helps reduce the cost of the degree programs. Since CDTD prefix courses are not required or allowed by other degree programs, the CDTD program does not receive the cost or productivity benefit.

APPENDIX D

Section 4 – Student Evaluation of Instruction

Supporting Information

Current Student Survey
Student Survey Comments
Question 7 List one thing you like about CDTD
Question 8 List on thing you like least about CDTD
Question 9 What could Ferris do to make the program better

CURRENT STUDENT SURVEY

2003 ACADEMIC PROGRAM REVIEW

CAD DRAFTING AND TOOL DESIGN TECHNOLOGY

Please answer all of the following questions truthfully and to the best of your ability. The survey is intended to help the faculty evaluate the program. The student survey will also be, used by the university, to help plan the future needs and direction of the tool design program.

Please mark the appropriate circle.

First year O Second year O

1. Why did you select the CAD Drafting Tool Design Program?

   A. Friend suggested program

   B. Family suggested program

   C. Teacher suggested program

   D. School counselor

   E. Advertising

   F. Quality and reputation

   G. Other _____

2. What could Ferris State University do to better promote the CAD Drafting Tool Design program? Please circle the item letter/s you feel would be the most successful.

   A. TV advertising.

   B. Radio advertising.

   C. Video sent to schools.

   D. Ferris WEB site.

   E. Visits to schools from a Ferris admission representative.

   F. CAD Drafting faculty visits to schools.

   G. Career center of high school field trips to see the CDTD program.

   H. Direct invitation to parents and students to visit the CDTD program.

   I. Brochures and materials sent to school counselors.

   J. Other: _____

3. Do you plan on obtaining a four-year degree?

Yes O No O

If yes, what program are you going into? _____

4. What percentage of educational time in the CDTD program should be spent on CAD?

1. ____100% 4. ____70%

2. ____90% 5. ____60%

3. ____80% 6. ____50%

5. Please rate the quality of instruction you have received in the CAD Drafting Tool Design Program.

	Excellent		Average		Poor
1. Quality of the material presented in class.	A	B	C	D	E
2. Material presented meets current standards.	A	B	C	D	E
3. Pace of material presented is appropriate.	A	B	C	D	E
4. Instructors care about your learning	A	B	C	D	E
5. Relevance of material presented.	A	B	C	D	E
6. Use of visual aids and materials	A	B	C	D	E
7. Difficulty of material in reference to the Level of the course.	A	B	C	D	E
8. Assignment objectives are well thought Out and clear to the student.	A	B	C	D	E
9. Use of media, white board, slides, visuals, Video, overheads, multi-media.	A	B	C	D	E
10. Lectures are well prepared and organized.	A	B	C	D	E
11. Faculty are available for help.	A	B	C	D	E
12. Materials are reviewed to insure students Gained and understanding of the information.	A	B	C	D	E
13. Student evaluation and grading is explained and clear to the student.	A	B	C	D	E
14. Testing and evaluation procedures are fair.	A	B	C	D	E
15. Graded material is returned in a timely manner.	A	B	C	D	E

Comments:_____

_____

_____

6. From what you have experienced in the CAD Drafting Tool Design program, how would you rate the quality of the following?

	Excellent		Average		Poor
1. CAD hardware	A	B	C	D	E
2. CAD software	A	B	C	D	E
3. Advanced equipment. (Rapid prototype, inspection tools)	A	B	C	D	E
4. Classroom (lighting, paint, floors)	A	B	C	D	E
5. Classroom furniture (chairs, tables)	A	B	C	D	E
6. Text books	A	B	C	D	E
7. Plotters	A	B	C	D	E
8. Printers	A	B	C	D	E
9. Faculty advising	A	B	C	D	E
10. Lab hours evening	A	B	C	D	E
11. Lab hours weekends	A	B	C	D	E
12. Student activities and clubs	A	B	C	D	E

7. What could Ferris do to make the CAD Drafting Tool Design program better? Base your statements on curriculum, instruction, materials, or classroom environment. (Please use the reverse side if you need more space.)

APPENDIX D

SECTION 4

STUDENT EVALUATION OF INSTRUCTION RESULTS

SURVEY RESULTS-FRESHMAN AND SOPHMORE CLASS April 2003

Sample size: 34 Freshman
21 Sophomores
55 Total responses

Question number 1 asked: Why the student selected the CDTD program. The top three responses were?

1. Their teacher suggested the program (18)
2. The student interest is the subject and career (12)
3. The quality and reputation of the program (10)

Question number 2 asked: What could FSU do to better promote the program?

1. High School and Career Center visits to the CDTD program. (32)
2. CDTD faculty visits too high schools and career centers. (29)
3. Brochures and materials sent to school counselors. (25)

Question number 3 asked: Do you plan on obtaining a four-year degree?

73% said YES (40) The following are a list of the programs of choice.

Product Design (21)
Education (9)
Manufacturing (4)
Plastics (1)
Engineering (1)
Undecided (4)

Question number 4 asked: What percentage of educational time in the CDTD program should be spent on CAD?

100%	(1)	90%	(9)
80%	(24)	70%	(13)
60%	(6)	50%	(2)

Question number 5 asked: Please rate the quality of instruction you have received in the CDTD program.

	RATING		
	Above Average	Average	Below Average
1. Quality of the material presented in class	51	4	
2. Material presented meets current standards.	52	2	1
3. Pace of material presented is appropriate.	38	11	6
			4-4

	RATING Student Responses		
	Above Average	Average	Below Average
4. Instructors care about your learning	48	5	2
5. Relevance of material presented.	50	5	
6. Use of visual aids and materials	50	4	1
7. Difficulty of material in reference to the Level of the course.	47	5	3
8. Assignment objectives are well thought out and clear to the student.	28	25	2
9. Use of media, white board, slides, visuals, Video, overheads, multi-media.	49	6	0
10. Lectures are well prepared and organized.	43	11	1
11. Faculty are available for help.	38	14	3
12. Materials are reviewed to insure students gained and understanding of the information.	41	11	3
13. Student evaluation and grading is explained and clear to the student.	46	6	3
14. Testing and evaluation procedures are fair.	44	7	4
15. Graded material is returned in a timely manner.	35	14	6

Question number 6 asked: From what you have experienced in the CAD Drafting Tool design program, how would you rate the quality of the following?

	RATING Student Responses		
	Above Average	Average	Below Average
1. CAD hardware	46	8	1
2. CAD software	47	5	3
3. Advance equipment. (Rapid prototype, Inspection Tools)	52	3	0
4. Classroom (Lights, Paint, Floors)	47	7	1
5. Classroom furniture	37	14	4
6. Texts	44	10	1
7. Plotters	37	18	0
8. Printers	36	19	0
9. Faculty advising	43	11	1
10. Lab hours evening	47	5	3
11. Lab hours weekends	20	15	20
12. Student activities and clubs	42	10	3
13. Have you used the library computers	26 yes	29 no	

Question number 7:
List one thing you like about the CDTD program

Working on the computers
Using CAD
Faculty
Student activites and clubs
The teachers care about teaching
Everything
CAD, when we are just designing things
Hands-on with software. Covers many aspects of technology
Varing projects
It's hands' on
Professors care about you learning and want to make the most out of it.
The people in the program. Mr. Wannink
Get to know the other students. Students help each other.
It's interesting to me.
The amount of lab time
Know I'm getting an education that will be well used in industy
The friends I've made in class, becaue we all have a similar of thinking that is idfferent from pe
other majors.
Self learning teaching style is very useful. Good program & software uses.
The quality of the information taught
Hands-on
I really appreciate the teachers and whow they care about studetns. Almost get along like a fa
The Association
Learning Experience
I am learning stuff about CAD

Hands-on! Classes work together.
Teachers are friendly and great to work with.
Using software
The work on solids and using mechanical
Very personal
Rapid prototyping
The variety of the materials taught.

The teachers are usually easy to get along with and I enjoyed the enviroment.
Being able to get help when needed.
The subject material
Die design
I liked the new lab and facilities. The printers could be updated.
Approachable and helpful instructors.

Comments Con't.

Projects heped to learn how items work.
Teachers
Learning new programs. CAD in general
I like how you can get to know the facutly and students better than other classes
Good Placement through experience
Teachers take enough ime for students to understand new material
The technology avaiable to studetnts.
The computer stations
The chance to work freely
The kindness
Friendly and focused faculty
There was a nice mix of lecture and lab.
Excellent instructors that care about us and everything.
I enjoyed learning new technological methods and enjoyed learning more about the industry it
Hands-on teaching approach

Question Number 8:
List one thing you like least about the CDTD program.

All the lab time
Walking to the 5th floor
CDTD-130
Faculty
Stressful, sometimes a lot of work going on at once
Price of books
Amount of work given. It's overwhelming
Only 2 class times to choose from. Hard to schedule classes for non-traditional students
The more difficult scale
Assignement expectations can be confusing
Long lectuers
8 am. Classes, faculty not always answering your question to where you fully understand

Board work
Work load
Some classes are paced much to fast. Take into consideration that we have other courses als
Work load.
Sitting still for so long
Computer stability is shakey. One day runs fine, next it rashes regularly. Next day some drawi runs fine again
Due dates and schedule is harsh. CDTD 130 class.
A lot of work, little time
Way too fast paced! It's easy to not get a thing done and it complies a lot.
CDTD 130 class
The amount of work without a lot of time to do it.
Not exactly what I thought the program would be based on.

Boring lectures (sometimes)
Too many projects at once.
Not having a book for class
CDTD 130 class!
Tool detailing class
Board work
The amount of homework given at one time.

I would personally change the scheduled hors and sessions.
Computers messing up
Long lab periods
Long lab hours and not enough extra curricular activity as groups.

Comments Con't.

Weekend lab hours
Boards! MFGT classes
To basic first year
Not sure, what to do while working on projects. Floating Feeling.
Old CAD programs, Auto CAD and Mechanical are not used! Industry will pull from Tech for th new programs.
I feel that the lab hours are long, some might work better if they were shorter. It is wasy to loos interest after 4 hours.
Working on the board for a whole semester
Mark Hill
The software used in CAE class seemed inefficient.
Better use of linking to computers
The mold flow softwares quakyness.
Dis-organization
Crashing software, and there needs to be more hands on to die design.
Tool Design
The elevator doesn't go to the 5th floor
I don't like the fact that there are no scheduled trips or speackers to enlighten studetns.
Lack of software variety taught.

Question number 9:
What could Ferris do to make the CDTD program better? Base your statements on curriculum, instruction, materials, or classroom environment. (Please use the reverse side if you need more space.)

First Year Comments:

Pace is too fast in CAD. You don't have time to absorb information and complete complex assignments before another assignment is given on new information.

I would not recommend this program to any of my friends because it's to hard and demanding and a few teachers ruined my experience at FSU.

I honestly feel we are required to do a lot of this. I also think SLA should be required. SLA. During the day if possible.

Need to even out the flow of homework. A 2-credit class should have less homework than a 4-credit class.

A little too much focus on board work rather than CAD. Too many assignments given in a short period of time.

Second Year Comments:

The classes that dealt with my major were excellent besides Material Science and Physics.

This program has connected me with a number of potential jobs. It has high credibility with industry.

Material covered in course should be taught before the projects are almost due. A lot of time was spent changing projects because the material was added halfway through.

APPENDIX E

Section 5 –Faculty Perceptions

Supporting Information

Faculty Perception Survey

FACULTY PERCEPTIONS
2003 PROGRAM REVIEW SURVEY
CAD DRAFTING / TOOL DESIGN

This survey was completed after careful review of the other surveys conducted for this program review. The concerns, comments, criticisms, responses, and recommendations of graduates, students, employers, and advisory committee members were evaluated and the questions for this survey were determined, in the most part, from those responses. The confidence expressed by the students and graduates in the faculty's ability and knowledge of the industry and in the presentation of the materials and industrial related applications affirms your role in this review process. It is of greatest importance that the views and opinions of each faculty member be expressed to continue this program's quality education. Please complete and return. Your assistance is sincerely appreciated.

Curriculum perceptions

1. The CDTD program should be expanded to four years.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments:

2. The amount of Geometric Dimensioning and Tolerancing should be increased.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments:

3. **The teaching and assigning of team projects should increase and possible CIM projects should be considered.**

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments:

4. **More computer aided engineering (CAE) courses and/or projects should be considered.**

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments:

5. **What percent of educational time in the Technical Drafting / Tool Design program should be spent on CAD?**

100%_____ 70%_____

90%_____ 60%_____

80%_____ 50%_____

6. **If we were to reduce the amount of time spent on the drawing board, what objectives do you feel are the most important to be learned on the board? Please check all items that you feel are important board skills.**

	Important	Not Important	No Opinion
Geometrical Construction	☐	☐	☐
Orthographic Projection	☐	☐	☐
Sketching	☐	☐	☐
Sectioning	☐	☐	☐
Auxiliary Views	☐	☐	☐
Dimensioning	☐	☐	☐
Assemblies	☐	☐	☐
Descriptive Geometry	☐	☐	☐

7. **For each of the items in the left hand column, please rate it's importance to the program and curriculum at the present time.**

	Vital to Program	Necessary	Should be Included	Somewhat Necessary	Not Required
CAD Solid models	☐	☐	☐	☐	☐
Parametric models	☐	☐	☐	☐	☐
Rapid prototyping	☐	☐	☐	☐	☐
CAE statics and Strengths	☐	☐	☐	☐	☐
CAE kinematics	☐	☐	☐	☐	☐
CAE moldfill	☐	☐	☐	☐	☐
GD&T	☐	☐	☐	☐	☐
CIM and other integrated technology	☐	☐	☐	☐	☐

8. **Looking toward the next five years and beyond, what subjects and topics should be emphasized in the CDTD two-year degree:**

	Greatly Emphasized	Somewhat Emphasized	Not Important
Board Drafting	☐	☐	☐
CAD Drafting	☐	☐	☐
Mold Design	☐	☐	☐
Die Design	☐	☐	☐

Jig. Fixture, Gage Design	☐	☐	☐
Special Machines	☐	☐	☐
Product Design	☐	☐	☐
Dimensioning, Tolerancing, GD&T	☐	☐	☐
CAE Applications	☐	☐	☐
3d and surfaced models	☐	☐	☐
Solid Modeling	☐	☐	☐
Parametric Technology	☐	☐	☐
Rapid Prototyping	☐	☐	☐
Rapid Tooling	☐	☐	☐
Machine Tool	☐	☐	☐
Tool Building	☐	☐	☐
Tool Path (CAM)	☐	☐	☐
CMM	☐	☐	☐
Laser Measuring	☐	☐	☐
Virtual Reality	☐	☐	☐
Other_____	☐	☐	☐

9. From your perspective, what are the major strengths and weaknesses of the curriculum for CAD Drafting/Tool Design program?

10. If you could change the CAD Drafting/Tool Design program in any way you desired, what would you do? This may include program content, materials, name, methods or configuration. Please be as open and candid as possible.

11. What resources would be necessary to change the program in the manner that you have listed above?

12. Rate the present resources and equipment.

	Excellent	Above Average	Average	Below Average
Classrooms	☐	☐	☐	☐
Drafting Boards	☐	☐	☐	☐
Drafting Machines	☐	☐	☐	☐
Seating	☐	☐	☐	☐
CAD hardware	☐	☐	☐	☐
Computer lecture stations	☐	☐	☐	☐
Plotters, printers	☐	☐	☐	☐
CAD software	☐	☐	☐	☐
CAE software	☐	☐	☐	☐

APPENDIX F

Section 6 – Advisory Committee Perceptions

Supporting Information

Committee List
Survey Cover Letter
Advisory Committee Perceptions Survey
Advisory Committee Survey Data

CAD Drafting Tool Design
Advisory Committee

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[redacted]

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

June 12, 2003

Dear Advisory Committee Member,

The CAD Drafting Tool Design Technology Program at Ferris State University is currently involved in a self-study of the program. The document is part of the university's Academic Program Review (APR) process. The University will review the APR document and recommendations will be made to maintain, enhance or remove the program. As part of the review process we are requesting input from advisory committee members. Please take a few minutes to complete the enclosed survey to provide us with your insights of the program and the tool design industry.

To assist you with the survey we would like to update you on our most recent changes and additions to the program. We have added a second design CAD lab. The lab has eighteen high performance pc's with flat screens for second year mold and die design students. We have added a projector in the lab for lecturing and presentations. Another change has been the addition of a new Stratasys Dimension and a Z-Corp. rapid prototyping machine. These machines allow us to validate solid models, and assemblies; and analyze tool applications. We also have inspection, and scanning capabilities with the use of our Faro Arm. We have reallocated our instructional hours, see enclosed check sheet, in the fundamental drafting and CAD classes. We are teaching drafting standards and sketching with a four semester credits (8 contact hr.) introduction class. We have increased our CAD instruction in the first and second semester to four semester credits (8 contact hr.). We have added a two credit (4 contact hr.) tool detailing class in the first year of the program. We have also changed the product detailing class to three credits (5 contact hr.) with advanced tolerancing and geometric dimensioning and tolerancing.

Your suggestions and advice is greatly appreciated and valued by the CAD Drafting Tool Design faculty and the University. We would like to thank you in advance and look forward to your response as soon as possible. If possible please return your survey by July 12, 2003.

Respectfully,

Rick Eldridge and
CAD Drafting Tool Design Faculty

CC: Enclosures

ADVISORY COMMITTEE

2003/2004 PROGRAM REVIEW SURVEY

CAD DRAFTING AND TOOL DESIGN TECHNOLOGY

Please complete and return in the enclosed envelope. Your assistance is sincerely appreciated.

1. The Advisory Committee meets often enough.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments _____

_____

2. The advisory committee members are adequately utilized by the CAD Drafting and Tool Design Program.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments _____

_____

3. Suggestions from the Advisory Committee are encouraged and adopted by the program.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments _____

_____

4. Advisory Committee input is of value to the CAD Drafting Tool Design program?

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments _____

_____

5. Long-term employment opportunities remain strong in the tool design field.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5

Comments _____

_____

6. How important is tool detailing in the Tool Design industry?

Important		Somewhat Important		Not Important
1	2	3	4	5

Comments _____

_____

7. What percentage of your design work is done in solid modeling?

100% _____ 70% _____

90% _____ 60% _____

80% _____ 50% _____

8. From the list of drafting and design skills, please rate the educational importance.

	Greatly Emphasize	Somewhat Emphasize	Not Important
Drafting Standards			
Geometric Construction			
Orthographic Projection			
Sketching			
The use of drawing tools when sketching.			
Sectioning			
Auxiliary Views			
Dimensioning			
Assemblies			
Bill of Materials			
Descriptive Geometry			
Geometric Dimensioning And Tolerancing			
Mold and Die Design software (Unigraphics applications)			
Parametric Technology			
Rapid Tooling			
Rapid Prototyping			
Other:			

Comments: _____

_____

9. Looking toward the next five years and beyond, what subjects and skills should be emphasized in the CAD Drafting Tool Design two-year degree?

	Greatly Emphasized	Somewhat Emphasized	Not Important
Board Drafting			
Cad Drafting			
Mold Design			
Die Design			
Jig, Fixture, Gages			
Tool Detailing			
Product Detailing			
Dimensioning			
Geometric Dimensioning and Tolerancing (GD&T)			
CAE applications			
Mold and Die Design software			
3-D models, W/surfaces			
Solid Modeling			
Parametric Technology			
Rapid Prototyping			
Rapid Tooling			
Machine Tool			
Tool Building			
Tool Path (CAM)			
CMM			
Laser Measuring & Scanning			
Virtual Reality			
Other:			

Comments: _____

_____

10. From your perspective, what are the major strengths and weaknesses of the CAD Drafting Tool Design Program at Ferris State University? Please be open and candid.

Strengths: _____

_____

Weaknesses: _____

_____

11. If you could change the CAD Drafting and Tool Design Program in any way you desired, what would you do? This may include program content, materials, name, or configuration (Maybe a four-year Tool Engineering Degree). Please be as open and candid as possible.

ADVISORY COMMITTEE
SUMMARY OF DATA

2003/2004

ACADEMIC PROGRAM REVIEW SURVEY

CAD DRAFTING AND TOOL DESIGN TECHNOLOGY

1. The Advisory Committee meets often enough.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
(1)	(1)	(3)		

AVERAGE RANK 2.4

COMMENTS: Once a year is enough. Gives time to make changes and see how they fly

2. The advisory committee members are adequately utilized by the CAD Drafting and Tool Design Program.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
(1)	(3)	(1)		

AVERAGE RANK 2.0

NO COMMENTS!

3. Suggestions from the Advisory Committee are encouraged and adopted by the program.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
(3)	(1)	(1)		

AVERAGE RANK 1.6

NO COMMENTS!

4. Advisory Committee input is of value to the CAD Drafting Tool Design program?

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
(2)	(2)	(1)		

AVERAGE RANK 1.8

COMMENTS: I think it is very useful for a University to utilize industry to direct changes in a program. After all you are teaching students to be prepared for industry. They go hand in hand.

5. Long-term employment opportunities remain strong in the tool design field.

Strongly Agree		Neutral		Strongly Disagree
1	2	3	4	5
	(1)	(4)		

AVERAGE RANK 2.8

COMMENTS: This industry (tooling) is very shaky now but the design is one of the things not affected by global economy. The overseas competition is more apt to copy not design.

6. How important is tool detailing in the Tool Design industry?

Important		Somewhat Important		Not Important
1	2	3	4	5
(1)	(2)	(2)		

AVERAGE RANK 2.2

COMMENTS: It isn't as important as it once was, now a lot of machining is done direct from solid models created while designing it goes direct to CAM software and out to the machine. Our facility uses dimensions for only about 25% of machine work completed.

7. What percentage of your design work is done in solid modeling?

100% -1
95% -1
50% -1
70% -1
10% -1

8. From the list of drafting and design skills, please rate the educational importance.
NUMBER OF RESPONSES ARE SHOWN IN EACH COLUMN

	Greatly Emphasize	Somewhat Emphasize	Not Important
Drafting Standards	3	2	
Geometric Construction	3	2	
Orthographic Projection	4	1	
Sketching	1	4	
The use of drawing tools when sketching.	1	4	1
Sectioning	4	1	
Auxiliary Views	4	1	
Dimensioning	2	3	
Assemblies	3	2	
Bill of Materials	2	3	
Descriptive Geometry	3	1	
Geometric Dimensioning And Tolerancing	2	3	
Mold and Die Design software (i.e. design wizard)	2 *	2	
Parametric Technology	2	3	
Rapid Tooling	3	1	
Rapid Prototyping	3		1
Other:	**		

Comments: * Design wizard are great but there are so many. I feel the basics manual 3-d computer design wire and surface solids is more important at this level. The wizard will only enhance that after working in the field. But exposing is good because it could really help struggling companies to find new ways to be efficient.

** Hands on machining from their own prints.

9. Looking toward the next five years and beyond, what subjects and skills should be emphasized in the CAD Drafting Tool Design two-year degree?

NUMBER OF RESPONSES ARE SHOWN IN EACH COLUMN

	Greatly Emphasized	Somewhat Emphasized	Not Important
Board Drafting		3	2
Cad Drafting	4	1	
Mold Design	5		
Die Design	5		
Jig, Fixture, Gages	3	2	
Tool Detailing	2	2	
Product Detailing	2	2	
Dimensioning	2	2	
Geometric Dimensioning and Tolerancing (GD&T)	2	3	
CAE applications	3	2	
Mold and Die Design software	2	2	1
3-D models, W/surfaces	5		
Solid Modeling	5		
Parametric Technology	2	3	
Rapid Prototyping	3		1
Rapid Tooling	3	1	
Machine Tool	4	1	
Tool Building	2	2	
Tool Path (CAM)	1	3	1
CMM	1	2	1
Laser Measuring & Scanning	1	3	1
Virtual Reality		4	1
Other:	*		

COMMENTS: * Leave the CAM up to the machine tool program. It is useful however to know how to machine something when modeling it to help the machinist be efficient.

10. From your perspective, what are the major strengths and weaknesses of the CAD Drafting Tool Design Program at Ferris State University? Please be open and candid.

Strengths:

- Seem to be changing and moving with industry
- Students knowing the basics of all aspects of drafting and tool design.
- Up to date technology, extensive lab hours.
- Tool design and development, CAD exposure.

Weakness:

- See question 11
- Having skills with the latest "Industry" CAD systems. Catia, UG, Pro-E, etc.
- Product feasibility with an understanding of economics on making decisions with regard to tools.

11. If you could change the CAD Drafting and Tool Design Program in any way you desired, what would you do? This may include program content, materials, name, or configuration (Maybe a four-year Tool Engineering Degree). Please be as open and candid as possible.

COMMENTS:

- We in industry have an uphill battle with this global economy and tooling. Many jobs and companies no longer existence because of it. The major factors are the suppliers are looking for cheaper ways to get tooling. It has take profits out of American companies, because we can't compete with governments of other countries. I don't think by our government stepping in and imposing tariffs or subsidizing our industry will do the trick. What will bring us out of this and will strengthen this country as a whole is education. We must let our students know as soon as we can about what they are up against. Efficient companies with workers that constantly think of new and better ways of doing day to operations will be the only ones that survive and bring the work back to this country. This process, I believe, comes from the bottom up not from the top down. You are teaching these students- no better place to start this process than with our educators.
- I would focus on the manufacturing process in greater detail. Keep designs manufacturing friendly and easy to maintain. More attention to economics when designing tools. Today's market calls for that, to remain competitive. I would like to see product design offered as well. Included in this would be product feasibility to manufacture. Give students a well rounded understanding of the product design and development process. In order to accomplish this, this degree may be a four year program.
- A four-year tool engineering degree is an excellent idea. Both mold and die designs require more attention than one semester. This would help students more prepared for "real" world design situations.
- Add a forming simulation software module.
- While I do not have any recommendations for actual changes to the program, I would like to request that a strong emphasis be placed on drafting and design fundamentals with a focus on an underlying core principle. The primary purpose of drafting (the graphic representation of thought is to clearly communicate the intent by providing the maximum amount of useful data while inviting the minimum number of questions. What I am experiencing from young people

entering the design field workforce today is that too much time has been spent teaching the "how" at the expense of "what –"when"-"where"-and "why". To know how to draw and run CAD, how to program hot keys and shortcuts etc. are important but are virtually useless if you don't know what views are required, where to cut sections, why tolerance stack-ups are important, what machining process will be required to make the detail components, when to heat treat items etc.. Without a thorough understanding of these fundamentals of drafting there is little need to know how to do it.

APPENDIX G

Section 7 – Labor Market Analysis

Supporting Information

Institutional Research and Testing Data
U.S. Department of Labor Data
Career Builder Job Placement Data

Ferris State University
Placement Profile for 1998-99
in the College of TECHNOLOGY

Curriculum	Total Grads No.	Total Response No.	Response Rate %	Cont. Ed. Only: Ferris Undgr.	Cont. Ed. Only: Ferris Gr.	Cont. Ed. Only: Other Undgr.	Cont. Ed. Only: Other Gr.	Cont. Ed. & Employed: Ferris Undgr.	Cont. Ed. & Employed: Ferris Gr.	Cont. Ed. & Employed: Other Undgr.	Cont. Ed. & Employed: Other Gr.	Employed Only	Seeking Emp.	Not Seeking Emp.	Total Employed No.	Total Employed %	Total Cont. Ed. No.	Total Cont. Ed. %	Employed in field No.	Employed in field %
Bachelor																				
Auto & Hvy. Equip. Mgt.	24	17	70.8%	0	0	0	0	0	0	0	0	17	0	0	17	*100.0%*	0	---	16	*94.1%*
Comp. Netwks & Sys.	2	1	50.0%	0	0	0	0	0	0	0	0	1	0	0	1	*100.0%*	0	---	1	*100.0%*
Construction Mgt.	26	13	50.0%	0	0	0	0	0	0	0	0	12	1	0	12	*92.3%*	0	---	12	*100.0%*
Elect/Electron.Eng.Tech.	16	11	68.8%	0	0	0	0	0	0	0	0	11	0	0	11	*100.0%*	0	---	11	*100.0%*
Facilities Management	12	6	50.0%	0	0	0	0	0	0	0	0	6	0	0	6	*100.0%*	0	---	5	*83.3%*
Hvy.Equip.Serv.Eng.Tec	13	10	76.9%	0	0	0	0	0	0	0	0	9	1	0	9	*90.0%*	0	---	9	*100.0%*
HVACR Eng.Tech.	22	21	95.5%	0	0	0	0	0	0	0	0	21	0	0	21	*100.0%*	0	---	19	*90.5%*
Manufacturing Eng.Tech.	31	14	45.2%	0	1	0	0	0	0	0	0	13	0	0	13	*92.9%*	1	*7.1%*	12	*92.3%*
Plastics Eng. Technology	46	34	73.9%	0	0	0	0	0	0	0	2	32	0	0	34	*100.0%*	2	*5.9%*	31	*91.2%*
Printing Management	14	12	85.7%	0	0	0	0	0	0	0	0	12	0	0	12	*100.0%*	0	---	12	*100.0%*
Product Design Eng.Tech	23	19	82.6%	1	0	0	0	0	0	2	0	16	0	0	18	*94.7%*	3	*15.8%*	16	*88.9%*
Surveying Engineering	23	18	78.3%	0	0	0	0	0	0	0	0	18	0	0	18	*100.0%*	0	---	18	*100.0%*
Welding Eng.Tech.	18	18	100.0%	0	0	0	0	0	0	0	0	18	0	0	18	*100.0%*	0	---	18	*100.0%*
Associate																				
Architectural Tech.	27	20	74.1%	9	0	3	0	1	0	2	0	5	0	0	8	*40.0%*	15	*75.0%*	7	*87.5%*
Automotive Body	13	8	61.5%	5	0	0	0	0	0	0	0	3	0	0	3	*37.5%*	5	*62.5%*	3	*100.0%*
Automotive Serv.Tech.	39	29	74.4%	16	0	0	0	1	0	0	0	11	0	1	12	*41.4%*	17	*58.6%*	12	*100.0%*
Building Const.Tech.	28	23	82.1%	18	0	1	0	2	0	0	0	2	0	0	4	*17.4%*	21	*91.3%*	4	*100.0%*
Civil Engineering Tech.	9	6	66.7%	6	0	0	0	0	0	0	0	0	0	0	0	---	6	*00.0%*	0	---
Heavy Equipment Tech.	33	25	75.8%	11	0	0	0	1	0	0	0	10	3	0	11	*44.0%*	12	*48.0%*	9	*81.8%*
HVACR Technology	38	30	78.9%	15	0	0	0	1	0	1	0	12	1	0	14	*46.7%*	17	*56.7%*	14	*100.0%*
Industrial Elect. Tech.	11	7	63.6%	5	0	0	0	1	0	0	0	1	0	0	2	*28.6%*	6	*85.7%*	1	*50.0%*
Mfg Tooling Technology	15	11	73.3%	6	0	0	0	2	0	0	0	3	0	0	5	*45.5%*	8	*72.7%*	5	*100.0%*
Mechanical Eng. Tech.	13	9	69.2%	6	0	1	0	0	0	0	0	1	0	1	1	*11.1%*	7	*77.8%*	1	*100.0%*
Plastics Technology	55	40	72.7%	33	0	0	0	1	0	0	0	5	1	0	6	*15.0%*	34	*85.0%*	6	*100.0%*
Printing Technology	20	16	80.0%	11	0	0	0	0	0	1	0	4	0	0	5	*31.3%*	12	*75.0%*	4	*80.0%*
Surveying Technology	3	1	33.3%	1	0	0	0	0	0	0	0	0	0	0	0	---	1	*00.0%*	0	---
Tech.Dftg.&Tool Design	25	16	64.0%	6	0	0	0	2	0	1	0	7	0	0	10	*62.5%*	9	*56.3%*	9	*90.0%*
Technical Illustration	2	0	0.0%	0	0	0	0	0	0	0	0	0	0	0	0	---	0	---	0	---
Welding Technology	10	8	80.0%	7	0	0	0	0	0	1	0	0	0	0	1	*12.5%*	8	*00.0%*	0	---
Totals:	611	443	72.5%	156	1	5	0	12	0	8	2	250	7	2	272	*61.4%*	184	*41.5%*	255	*93.8%*

Some respondents continuing their education did not indicate what type of program they were entering or the school they would be attending. It was assumed that the respondent would be entering the next highest academic degree (i.e. an associate's degree graduate would be entering a bachelor's degree program).

Surveying Technology A.A.S.

Number of Degrees: 3 Responding: 1 (33.3%) Not Responding: 2 (66.7%)

Placement Rate = 100% (1)

Continuing Education	1	Seeking Employment	0
Employed	0	Not Seeking	0
Both Employed & CE	0		

(No Salary Responses)

Employment Rate = N/A

Employed	0	In Field	0
		Completed Internship	0
		With Current Employer	0
Seeking	0		
Total in Job Market	0		

Technical Drafting and Tool Design A.A.S.

Number of Degrees: 25 Responding: 16 (64.0%) Not Responding: 9 (36.0%)

Placement Rate = 100% (16)

Continuing Education	6	Seeking Employment	0
Employed	7	Not Seeking	0
Both Employed & CE	3		

Salary Scale (Full-Time)

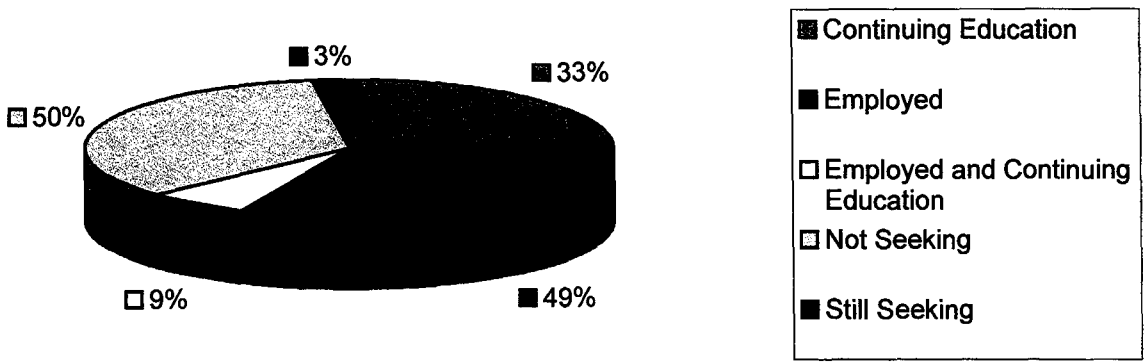
$10-12 K	$13-15 K	$16-19 K	$20-23 K	$24-27 K	$28-31 K	$32-35 K	$36-39 K	$40-43 K	$44-47 K	$48-51 K	$52-55 K	> $55 K
1			3	1	2	1				1		

Employment Rate = 100%

Employed	10	*(63%)*	In Field	9	*(90%)*
			Completed Internship	6	*(60%)*
			With Current Employer	2	*(33%)*
Seeking	0				
Total in Job Market	10				

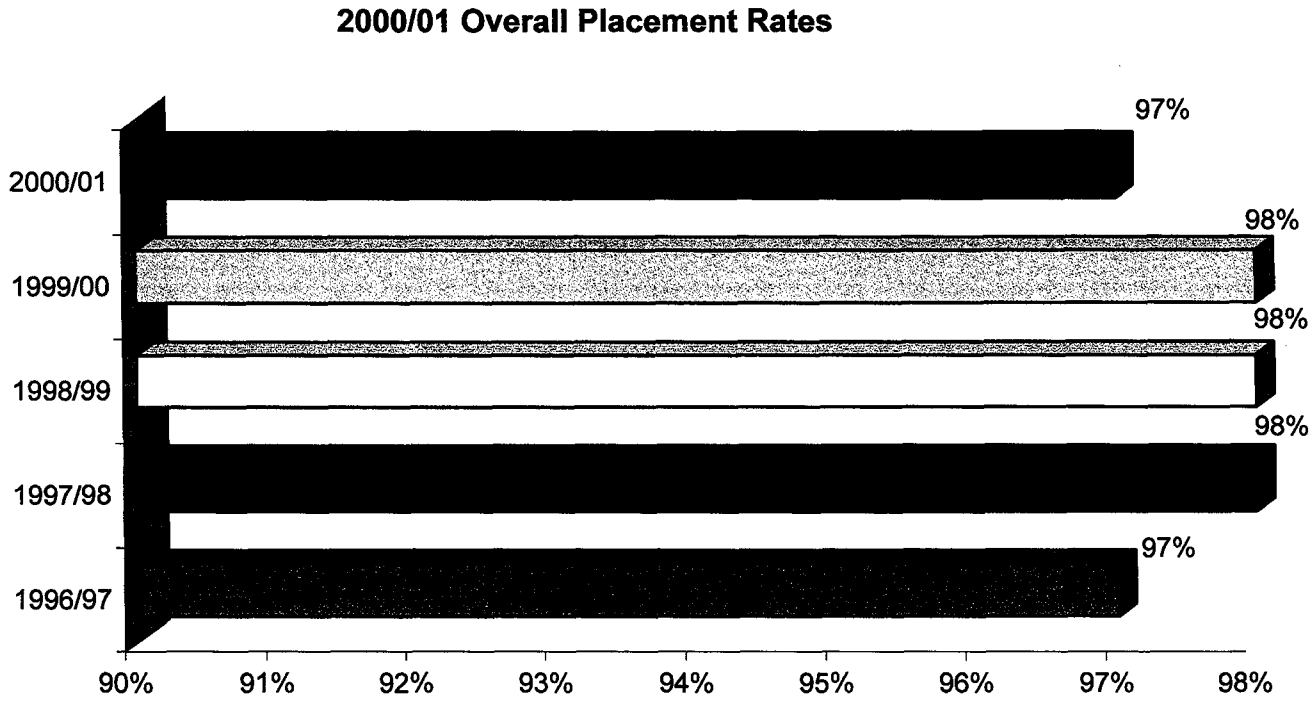
2000/2001 Graduate Follow-Up Survey - Overall Results

2000/01 Graduate Composite



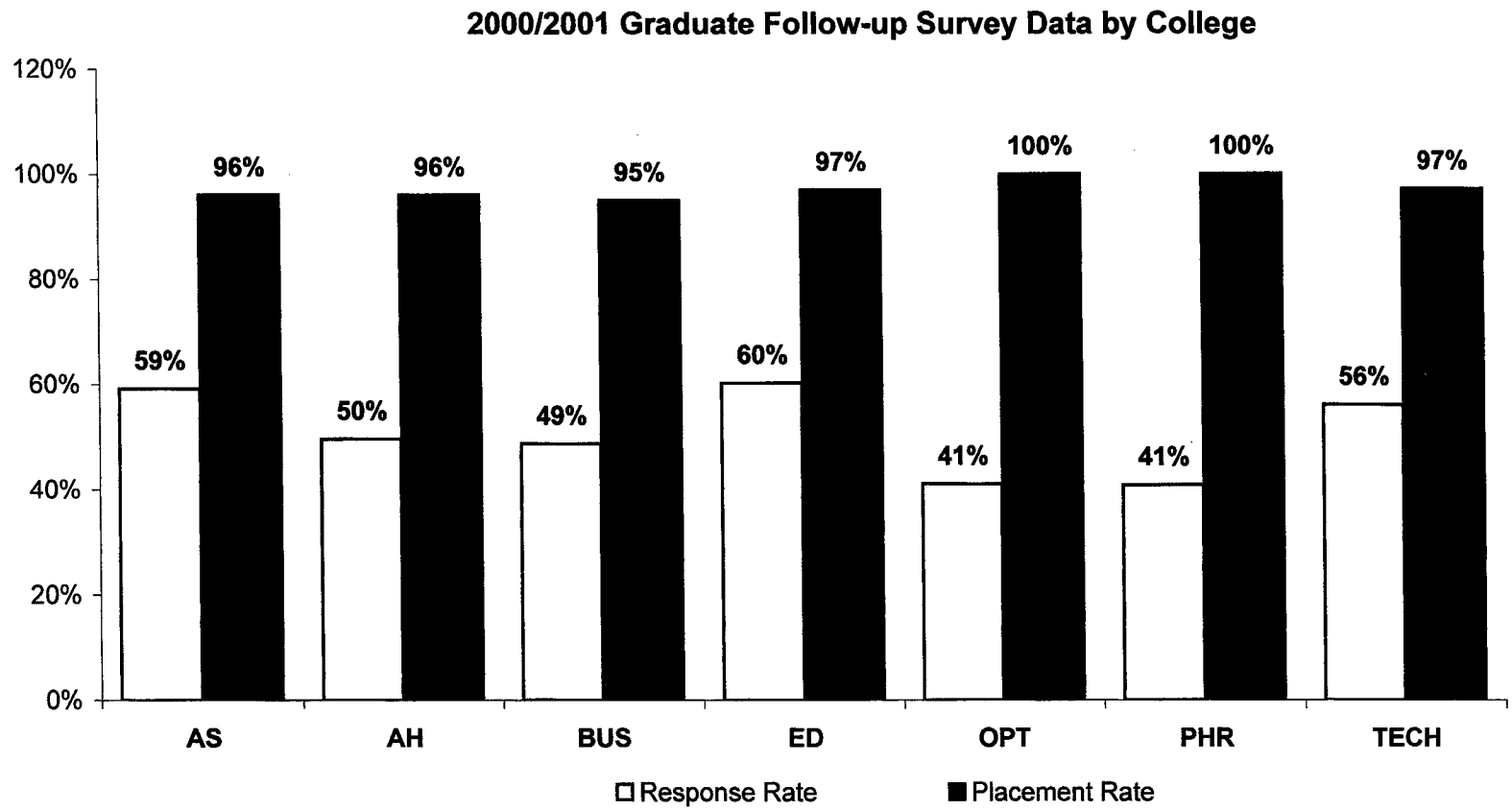
Note: 91% of Graduates who are employed are employed in their field of study. That figure is up 1% from the previous graduate survey.

2000/2001 Graduate Follow-Up Survey - Overall Results



Note: Respondents included here include those who are employed, or continuing their education full-time. Placement rates and salaries were stable overall for the 2000/01 graduates, but according to a NACE study where employers were asked to compare the number of new college graduates they hired in 2000-2001 to those they expect to hire in 2001-2002, they estimated a 36.4 percent drop in hiring (NACE Job Outlook-2002).

2000/2001 Graduate Follow-Up Survey - Overall Results



Note: The response rates for this iteration of the survey are lower than in previous years. For example, the rate for last year's survey was 63.8%. This was a transitional year for the survey, and we are working to raise the number of responses with the next survey for 2001-2002 including surveying students at the Financial Aid Exit Interviews, and working to update contact information on a more consistent basis. When compared to other studies of a similar nature at other institutions, however, our response rates are quite high.

2000/2001 Graduate Follow-Up Survey Summary

College: Technology

Program Name	Degree	# of Grads	% Response	# Responses	Placement Rate	# Job &/or CE	Ave Salary	Median	Ave Salary-NACE
Architectural Technology	AAS	16	56%	9	100%	9	N/AV	N/AV	N/AV
Automotive and Heavy Equipment	BS	10	70%	7	100%	7	$ 40,549	$ 38,625	N/AV
Automotive Body	AAS	1	0%	0	N/AV	0	N/AV	N/AV	N/AV
Automotive Machine Technology	AAS	50	66%	33	97%	32	N/AV	N/AV	N/AV
Automotive Service Technology	AAS	33	64%	21	100%	21	$ 33,657	$ 31,900	N/AV
Building Construction Technology	AAS	42	83%	35	100%	35	$ 34,789	$ 33,625	N/AV
CAD Drafting & Tool Design Technology	AAS	15	60%	9	100%	9	N/AV	N/AV	N/AV
Civil Engineering Technology	AAS	13	62%	8	100%	8	N/AV	N/AV	N/AV
Computer Networks and Systems	BS	11	55%	6	83%	5	N/AV	N/AV	$46,464
Construction Management	BS	42	52%	22	95%	21	$ 43,690	$ 40,875	N/AV
Electrical/Electronics Engineering	BS	16	50%	8	88%	7	$ 45,882	$ 44,100	$50,123
Facilities Management	BS	14	43%	6	100%	6	$ 34,710	$ 33,560	N/AV
Heavy Equip Service Engineering	BS	5	80%	4	100%	4	$ 35,960	$ 33,244	N/AV
Heavy Equipment Technology	AAS	30	57%	17	100%	17	$ 33,911	$ 34,850	N/AV
HVACR Engineering Technology	BS	36	72%	26	96%	25	$ 47,632	$ 46,675	N/AV
HVACR Technology	AAS	28	68%	19	100%	19	$ 33,284	$ 35,200	N/AV
Industrial Electronics Technology	AAS	16	69%	11	91%	10	N/AV	N/AV	N/AV
Manufacturing Engineering Technology	BS	32	63%	20	100%	20	$ 51,326	$ 50,099	$46,650
Manufacturing Tooling Technology	AAS	23	74%	17	100%	17	$ 34,725	$ 35,100	N/AV
Mechanical Engineering Technology	AAS	14	57%	8	100%	8	N/AV	N/AV	N/AV
Plastics Engineering Technology	BS	46	65%	30	97%	29	$ 47,840		$43,145
Plastics Technology	AAS	39	79%	31	100%	31	N/AV	N/AV	N/AV
Printing Management	BS	18	61%	11	100%	11	$ 31,850	$ 32,075	N/AV
Printing Technology	AAS	30	73%	22	100%	22	$ 23,680	$ 22,980	N/AV
Product Design Engineering Technology	BS	17	59%	10	100%	10	$ 46,300	$ 46,955	$43,145
Quality Engineering Technology	BS	6	50%	3	100%	3	N/AV	N/AV	N/AV
Rubber Technology	AAS	6	50%	3	100%	3	N/AV	N/AV	N/AV
Surveying Engineering	BS	15	67%	10	100%	10	$ 42,500	$ 43,799	N/AV
Surveying Technology	AAS	1	0%	0	N/AV	0	N/AV	N/AV	N/AV
Technical Drafting and Tool Design	AAS	5	80%	4	100%	4	N/AV	N/AV	N/AV
Welding Engineering Technology	BS	14	71%	10	100%	10	$ 50,166	$ 52,100	$46,650
Welding Technology	AAS	15	67%	10	100%	10	N/AV	N/AV	N/AV
College of Technology Total		**659**	**65.2%**	**430**	**98%**	**423**			
Ferris State University Total		**2083**	**56.1%**	**1169**	**97.1%**	**1136**			

NACE = National Association of Colleges and Employers

About 2001 National, State, and Metropolitan Area Occupational Employment and Wage Estimates

The **National**, **State**, and **Metropolitan Area** Occupational Employment and Wage Estimates are calculated from data collected in a national survey of employers. Data on occupational employment and wages are collected from employers of every size, in every State, in metropolitan and non-metropolitan areas, in all industry divisions. These estimates are cross-industry estimates; each occupation's employment and wage estimates are calculated from data collected from employers in all industry divisions. Self-employed persons are not included in the survey or estimates. Since 1999 the OES program has used the **Standard Occupational Classification (SOC) system**.

The National, State, and Metropolitan Area Occupational Employment and Wage Estimates consist of the following:

- **SOC Code Number**: the Standard Occupational Classification (SOC) system's unique, six-digit (plus hyphen) numerical identifier for each occupation. *When the SOC code is a link, clicking on it leads to a page that contains the occupational definition and national cross-industry estimates.*
- **Occupation Title**: a descriptive title that corresponds to the SOC code.
- **Employment**: the estimated total occupational employment (not including self-employed).
- **Median Hourly Wage**: the estimated 50th percentile of the distribution of wages based on data collected from employers in all industries; 50 percent of workers in an occupation earn less than the median wage, and 50 percent earn more than the median wage.
- **Mean Hourly Wage**: the estimated total hourly wages of an occupation divided by its estimated employment, i.e., the average hourly wage.
- **Mean Annual Wage**: the estimated total annual wages of an occupation divided by its estimated employment, i.e., the average annual wage.
- **Mean RSE** : the Relative Standard Error of the mean wage estimates, a measure of the reliability or precision of the mean wage estimates. The relative standard error is defined as the ratio of the standard error to the survey estimate. For example, a relative standard error of 10 percent implies that the standard error is one-tenth as large as the survey estimate.
- **Employment RSE** : the Relative Standard Error of the employment estimate, a measure of the reliability or precision of the employment estimate. The relative standard error is defined as the ratio of the standard error to the survey estimate. For example, a relative standard error of 10 percent implies that the standard error is one-tenth as large as the survey estimate.
- **Percentile Wage Estimates** : (National estimates only) A percentile wage estimate shows what percentage of workers in an occupation earn less than a given wage and

Current Search: **tool design, Design Engineering Jobs in MI, US**

New search Search within these results

Keyword(s): tool design **Date:** Last 30 Days Search

Modify this search

Save this search

Email me jobs like these

Job Search Results

View By: Title & Details **Jobs 1 - 13 of 13 Results Found** **Page 1 of 1**

Location	Title	Company	Pay	Date
MI-Iron Mountain	**Facility Maintenance Engineer** For more than a hundred years, we've worked to exceed the expectations of our customers. We can tap into all the resources that you'd expect from a worldwide, multi-billion-dollar organization. Although Johnson Controls is a big, established company [more] Experience Required: At Least 3 Years Employee Type: Part-Time	Johnson Controls Inc	$19.00 - $26.00/Hr	06/09
MI-Auburn Hills	**Senior Electrical Estimator** A Bachelor's degree in Electrical **Engineering**, **Engineering** Technology, or equivalent years of field experience is required, along with a minimum of 5 years of experience in the role of Estimator. Knowledge of local and national electrical codes... [more] Experience Required: More than 5 Years Employee Type: Full-Time	Johnson Controls Inc		06/09
MI-Southern Michigan	**Product Engineer** ...knowledge of detailed **engineering** principles and...methods to provide **design** support of new...evaluate new **design** concepts, ideas, materials or **engineering** tools in support...Using sound **engineering** methods and strong **design** skills, manufacturing... [more] Experience Required: More than 5 Years Employee Type: Full-Time		$65K - $73,600	06/05
MI-Novi	**Powertrain Senior Design Engineer** ...addition to internal teams in development, calibration, build and test for powertrain projects -Would have the most up-to-date **CAD**/CAE tools - Would work closely with the programs project manager and report to the **design** manager, powertrain systems [more] Experience Required: More than 5 Years Employee Type: Full-Time	DGE Inc		06/02
MI-Novi	**Powertrain Calibration Engineer**	DGE Inc		06/02

This job requires 3-6 years in powertrain calibration and an **Engineering** Degree minimum, masters degree preferable CareerBuilder Related Terms: **design**, develop, hardware, software, motor, chassis, gauge, parts, repair, automotive, mechanical... [more]

Experience Required: At Least 3 Years Employee Type: Full-Time

MI-Auburn Hills	**Catia Expert/Trainer**	DGE Inc		06/02

Assist other **engineers** and **designers** with CATIA **CAD** software - solids and surfacing skills development. Teach others data management tools usage and capabilities. [more]

Experience Required: At Least 1 Year Employee Type: Contractor

MI-Detroit	**Mechanical Engineer**	Bose Corporation		05/25

...Motors and Bose Resident **engineers** in the development and...components into new vehicle **designs**. You will coordinate...alternatives that satisfy **engineering** principals, manufacturing...targets. You will validate **designs** through modeling and...responses, and modify **designs** as appropriate. Responsibilities... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Detroit	**TOOLING ENGINEER**	Tower Automotive		05/23

Tooling **Engineer** - Elkton, MI Business...automotive stamping **tool** & die - **Tool** & Die...or Manufacturing **Engineering** - Knowledge of estimating...follow tools from **design** through implementation...detail to facilitate **engineering**/product changes...of high-quality, **engineered** metal stamping... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Mason	**Electrical Design Engineer**	Dart Container Corporation		06/10

...coordinates electrical **designs** of moderate scope adhering...to commonly employed **engineering** principles, practices...work of electrical **designers** and technicians, with...production plant and **engineering** personnel to define...guiding and assisting **Designers** and Technicians as... [more]

Experience Required: At Least 1 Year Employee Type: Full-Time

MI-Plymouth	**Process Engineer**	ProSource	$55K - $69K	06/05

...components. The process **engineer** will be responsible...processes and procedures; **designing** and managing the construction...Interfaced with product **engineering** early in the **design** phase on new products...for manufacturing **design**; supports manufacturing... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Holly	**Software Design Engineer (GBL359)**	GBL Resources, Inc.	$70K - $80K	06/03

...carefully before replying!!! We currently have a long term contract employment opportunity in Holly, MI. for a Software **Design Engineer**. MUST BE US CITIZEN OR PERMANENT RESIDENT! YOU MUST MEET ALL OF THE REQUIRED SKILLS AND YOUR RESUME MUST REFLECT... [more]

Experience Required: More than 5 Years Employee Type: Contractor

MI-Detroit	**INJECTION MOLDING ENGINEERING**	Mayco Plastics	06/02

...has the following opportunities: Manufacturing **Engineer**: Hands on role, cell **design** and layout, assist with the APQP process and plant...process records, support production and conduct **tool** tryouts. MOLDING SUPERVISORS: Able to process... [more]

Experience Required: At Least 1 Year Employee Type: Full-Time

MI-Detroit	**PROCESS ENGINEER**	Alcoa Automotive	06/02

...has an opening for a Process **Engineer** in our Northwood, Ohio facility...are: BS degree in a major **engineering** discipline, Minimum 3 to 5...working experience in a Process **Engineering** capacity, preferably related...includes leadership in the **design** and implementation of Alcoa... [more]

Experience Required: At Least 3 Years Employee Type: Full-Time

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Current Search: **tool design, Process Engineering Jobs**

New search Search within these results

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Location	Title	Company	Pay	Date
CA-Sunnyvale	**Software Engineer Sr Stf**	Lockheed Martin Corporation		06/11

...software **process engineering** and **process**...Electrical **Engineering** or Computer...software **design**, development...Software **Process** required...hardware **engineers** in the planning, **design**, development...electronic data **processing** systems software...Software **Engineering** Job Designation...Software **Engineer** Relocation... [more]

Experience Required: Not specified Employee Type: Full-Time

IN-Warsaw **Process Engineer** 06/11

...introductions. **Engineering** services include **process** development...management, **tool design** and CNC programming...Deviation **process**, Zimmer **Engineering** Specifications...manufacturing and **design** requirements...or other **engineering** science...Statistical **Process** Control skills...Computer Aided **Design** Systems... [more]

Experience Required: At Least 3 Years Employee Type: Full-Time

IN-Warsaw **Engineer / Sr. Engineer** 06/11

...for providing manufacturing **engineering** service to support cellular...documentation, equipment justification, **process** improvement, and integration...combination of experience with **Process Engineering**, **Tool Design**, and CNC Programming (machining... [more]

Experience Required: At Least 3 Years Employee Type: Full-Time

MA-Andover **Process Engineer 1** Raytheon Company 06/10

...Conformal Coat department -Develop Rubber Masking boots(Mold/**Tool design**), masking fixtures, and Die Cut tape -Benchmark new masking...finish, and Urethane vs. parylene requirement study -**Process** development Position: Full-Time Security Clearance... [more]

Experience Required: Not specified Employee Type: Full-Time

PA-State College **CMMI Process Engineer** Raytheon Company 06/10

...environmental system **designed** to help preserve...Responsibilities: CMMI **Process Engineer** needed to...and System **Engineering**. This position...business. This **engineer** will support **process** deployment...use of the **processes**. Following...appraisal, this **engineer** will support... [more]

Experience Required: Not specified Employee Type: Full-Time

KS-Wichita **ENGINEERING MANAGER** EATON & ASSOCIATES $75K - $87K 06/10

...plastics molder, is seeking an hands-on **Engineering** Manager with 10+ years experience in **processing** and tooling in the automotive and...new projects from conception, to **design**, to placement and management of **tool** construction to finished product... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

CA-Buena Park **PROJECT / PROCESS ENGINEER** EATON & ASSOCIATES $65K - $75K 06/10

Project/**Process Engineer**: Our client, a major OEM for a global...finished product. Must have plastics **design**, development and tooling background...working knowledge of project management, **tool**/mold **design**, **design** plastics parts, computer skills and... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

OH-Northern Ohio **Product Development - Process Engineer - automotive, CNC** MSK EAST $60K - $75K 06/06

...Development **Engineer** to develop the **processes** for new products...responsible for **design** of manufacturability...selection, **tool design**, future **design**, routings...component **processing** skills should...Manufacturing **Engineer**, Computer...Approval **Process**, Advanced... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

AZ-Southern Arizona **Process Engineer (VMC, CNC lathes, grind, screw machines)** MSK EAST $60K - $68K 06/06

...rounded Precision Machining Manufacturing **Engineer**. This position is responsible for **processing** and tooling multispindled screw machines...reductions, lean manufacturing techniques, SMEO, **tool design** and continuous improvements. This position... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

IN-Warsaw **Process Engineer - CNC Machining** Career Transitions, LLC $55K - $72,500 06/05

...manufacturer seeks a **Process Engineer** for their...manufacturing **engineering** service (**Process Engineering**) to support...implementation. The **Process Engineer** has responsibilities...improvement, **tool design**, CNC programming...integration of new **process** technologies... [more]

Experience Required: At Least 3 Years Employee Type: Full-Time

FL-Ocala **Manufacturing Engineer Asc** Lockheed Martin Corporation 06/05

...degree in an **engineering** discipline...Description: **Designs** and

plans...plastics **processing**, welding...statistical **process** control...guidance to **Engineering** regarding **design** concepts...Department: **Process Engineering** - Eatf Relocation... [more]

Experience Required: Not specified Employee Type: Full-Time

CA-Goleta	**Infrared Detector Process Engineer**	Raytheon Company		06/03

...night up to 500 yardsSIVAM - an environmental system **designed** to help preserve the planet's largest rain forestState...Mission Aircraft Responsibilities: Infrared Detector **process engineer**: work in cleanrooms and analytical meaurement laboratories... [more]

Experience Required: Not specified Employee Type: Full-Time

NY-Melville	**Process Engineer**	Globalforce International Inc.	$65K - $80K	05/30

IMPLEMENT **PROCESS** IMPROVEMENTS, ANALYZE FAILURES, INSTALL NEW EQUIPMENT, **DESIGN** PRODUCTION TOOLING, IMPROVE PREVENTATIVE MAINTAINANCE PROCEDURES. [more]

Experience Required: More than 5 Years Employee Type: Full-Time

CA-Ventura	**Process Engineer II**	Aerotek Contract Engineering	05/29

...developing **process** flow diagrams...providing **engineering** support during...and write **design** documents (**design** basis, acceptance...addition, the **Process** Optimization...Chemical **Engineering** or Material...with strong **process engineering** skills, good... [more]

Experience Required: None Specified Employee Type: Full-Time

CA-Ventura	**Process Engineer I**	Aerotek Contract Engineering	05/29

...developing **process** flow diagrams...providing **engineering** support during...and write **design** documents (**design** basis, acceptance...addition, the **Process** Optimization...Chemical **Engineering** or Material...with strong **process engineering** skills, good... [more]

Experience Required: None Specified Employee Type: Full-Time

CA-El Segundo	**Principal Manufacturing Engineer - EO**	Raytheon Company	05/27

...environmental system **designed** to help preserve...Manufacturing **Engineering**, **Process Engineering**, Supplier...assembly **processes** for optical...assembly. **Design**, fabrication...Recommend **design** or test methods...statistical **process** control procedures... [more]

Experience Required: Not specified Employee Type: Full-Time

CA-El Segundo	**Sr. Manufacturing Engineer 2 - EO**	Raytheon Company	05/27

...environmental system **designed** to help preserve...Manufacturing **Engineering**, **Process Engineering**, Supplier...assembly **processes** for optical...assembly. **Design**, fabrication...Recommend **design** or test methods...statistical **process** control procedures... [more]

Experience Required: Not specified Employee Type: Full-Time

RI-Portsmouth	**Manufacturing/Process Engineer**	Raytheon Company		05/27

...in documenting **processes** for use by assembly...Provides guidance to **Engineering** regarding **design** concepts and specification...techniques. May also **design** and plan layout...work. Emphasis on **process** development, implementation...performance of **processes**, equipment, and... [more]

Experience Required: Not specified Employee Type: Full-Time

OK-Chickasha	**Project Manager / Process Engineer**	Factor Software		05/26

The Project Manager / **Process Engineer** will report directly to the...Development. Take a lead role in re-**engineering** the SDLC **process** and facilitation of SEPG meetings...contractual obligations, ensure proper **process** including approval and funding... [more]

Experience Required: At Least 3 Years Employee Type: Full-Time

CA-Anaheim	**Process Engineer - Cable**	Extron Electronics		05/22

...knowledge in injection molding and dies. Experience in developing manufacturing assembly instructions and **designing** and implementing use of hand assembly tools and fixtures required. Must understand cable and connector assembly **process** and equipment. [more]

Experience Required: More than 5 Years Employee Type: Full-Time

NC-Research Triangle Park	**Process Engineer II**	Biogen Inc		05/22

...company. Category: **Engineering** Individual will **design**, specify and install...manufacturing use of **process** equipment, including...protocols, and updating **engineering** documentation. Individual...manufacturing and global **engineering**. [more]

Experience Required: At Least 3 Years Employee Type: Full-Time

DE-Statewide	**Process/Manufacturing Engineer**	Main Line Personnel Services, Inc	$65K - $65K	05/16

...**ENGINEER** Call Sunday #: 610-668-5054 INJECTION MOLDING/**PROCESS ENGINEER** Large local custom injection molding client requires...and seconary equipment run optimally. Assist in new **tool design**/modification and customers in developient/manufacturing... [more]

Experience Required: Not specified Employee Type: Full-Time

NC-Charlotte	**Manufacturing Engineer**	Spherion, Making the Workplace Work Better	$50K - $50K	05/14

...looking to add a Manufacturing/**Process Engineer** to their team. Position is located...Must have a four-year degree in **Engineering** (ME or IE is preferred), ideally...manufacturing Routings Cost reduction **Tool design** Company is not offering relocation... [more]

Experience Required: Not specified Employee Type: Full-Time

VA-Virginia Beach	**Software Engineer Sr**	Lockheed Martin Corporation		05/14

...position will **design**, develop...collect, **process**, and disseminate...Business **process engineering** 8) Software...equipment **designers** and/or hardware **engineers** in the planning...hardware

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Location	Title	Company	F
MI-Detroit	**Clay Modeler**	Aerotek Automotive	

...clay. The positions responsibilities also include taking dimensional measurements and assisting studio personnel in developing **design** solutions. The candidate must have at least seven years of hands-on automotive clay modeling experience. Experience with Tarus... [more]

Experience Required: None Specified **Employee Type:** Contractor

MI-Livonia	**Instrumentation Technician**	Manpower Professional	$ $

POSITION DESCRIPTION: Troubleshooting, repair and/or calibration of dynamometer test cells, chassis rolls, test stands, environmental/NVH chassis rolls and hemi-anechoic chamber. Diagnose, calibrate, and maintain all electronic/electrical compone [more]

Experience Required: At Least 1 Year **Employee Type:** Contractor

MI-Livonia	**Product Test Technician**	Manpower Professional	$ $

POSITION DESCRIPTION: Removing, installing, and troubleshooting engines, transmissions and their related connections to mechanical, electrical, and hydraulic systems for preparation and operation of transmission and converter tests. Keep a clean a [more]

Experience Required: At Least 1 Year **Employee Type:** Contractor

MI-Saginaw	**Software Engineer**	Technisource, Inc.	$ $

...RESPONSIBILITES: Under minimal supervision, **designs**, develops. debugs, evaluates and/or implements...Prepares proper documentation in accordance with **design** methodology and participates in software **design** reviews. Has working knowledge of entire software... [more]

Experience Required: Not specified **Employee Type:** Contractor

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Current Search: **tool design, Design Jobs in Detroit, MI, US**

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Location	Title	Company	F
MI-Ann Arbor	TOOLING DESIGN ENGINEER	Aerotek Automotive	

...automotive supplier is in need of a tooling **design** engineer. This person will be responsible for the complete engineering and **design** from concept to production for automation...half of the time will be spent on the **design** tube and doing critical **design** reviews... [more]

Experience Required: None Specified **Employee Type:** Contractor

MI-Detroit	Data Architect Consultant- Administration	Kforce	$ $

...Productivity tools: (IMS Expert, Expediter). Case tools development methodologies: Joint Application **Design** (JAD), Rapid Application **Design** (RAD). Techniques: IBM IIW (Insurance Information Warehouse). CRM environments: ETL (Extract Transform... [more]

Experience Required: Not specified **Employee Type:** Contractor

MI-Troy	IS Imaging Systems Developer / Analyst 3	FlagStar Bank

...Accountabilities: Technical Responsibilities 1.Develop and customize imaging and document management applications. 2.Write **design** specifications to meet business goals and project plans. 3.Develop applications within team's programming guidelines and standards... [more]

Experience Required: More than 5 Years **Employee Type:** Full-Time

MI-Detroit	Applications Developer	Kforce	$ $

...metropolitan area of Detroit, MI. Responsibilities: Serves as a team leaderor senior technical team member in the planning, **design**, development, implementation, and or support of moderately complex new/revised processes, systems, networks, or segments of... [more]

Experience Required: Not specified **Employee Type:** Contractor

applications...accomplish such requirements. Participates in the analysis, **design**, and quoting of all projects. Performs unit testing of all... [more]

Experience Required: Not specified **Employee Type:** Full-Time

MI-Detroit **Apartment Maintenance 7 Mile/Telegraph, 100 units**

Apartment Maintenance 7 Mile/Telegraph, 100 units. Must be exp'd., have own tools, have references. Salary + apt. 248-790-4333 Source - The Detroit News and Detroit Free Press - Detroit, MI [more]

Experience Required: Not specified **Employee Type:** Full-Time

MI-Detroit **DESKTOP PUBLISHER, ROBCAD OPER.** Valiant International Inc.

VALIANT INTERNATIONAL, INC Valiant is a leading full service systems supplier of automotive systems and automoive closure install systems. We have an immediate opening for: DESKTOP PUBLISHER A full time position for an experienced Desktop Publish [more]

Experience Required: Not specified **Employee Type:** Full-Time

MI-Ann Arbor **Engineer-Tool Designer Thermoforming Molds and Trays** IPR Automation

Concept and **design** of Thermoforming Tools and Trays using "Inventor" from Aitodesk or "Solid Model". [more]

Experience Required: More than 5 Years **Employee Type:** Full-Time

MI-Detroit **Prototype Automotive Fabricator For tubework**

Prototype Automotive Fabricator For tubework. TIG welder, own tools. Fax resume: 734-641-6535. Source - The Detroit News and Detroit Free Press - Detroit, MI [more]

Experience Required: Not specified **Employee Type:** Full-Time

MI-Holly **Software Design Engineer (GBL359)** GBL Resources, Inc. $ $

...read carefully before replying!!! We currently have a long term contract employment opportunity in Holly, MI. for a Software **Design** Engineer. MUST BE US CITIZEN OR PERMANENT RESIDENT! YOU MUST MEET ALL OF THE REQUIRED SKILLS AND YOUR RESUME MUST REFLECT... [more]

Experience Required: More than 5 Years **Employee Type:** Contractor

MI-Detroit **Business Intelligence / Data Warehouse Architect** Fast Switch, Ltd. $ $

...or Computer Science. Experience should also include 2-3 yrs as a Data Architect, 1 yr as a Data Modeler, 2 yrs as an ETL **designer** or developer, 2-3 yrs as a primary DW reporting application architect, 1-2 yrs as a researcher in ETL/Reporting tools and/or... [more]

Experience Required: More than 5 Years **Employee Type:** Contractor

MI-Detroit **SOFTWARE SPECIALIST**

...goals for creating and supporting internal applications through **design** and

MI-Plymouth	**Manufacturing Engineer**	Manpower Professional		05/27

We are looking for a Sr. Manufacturing Engineer for our Plymouth, MI plant facility to support production and maintenance on resolution of equipment issues, lead efforts to address customer concerns and quality rejects through 8d Process, identif [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Farmington Hills	**SENIOR PRODUCT ENGINEER - SWITCHES**	FEP Automotive Ltd	$70K - $80K	05/25

...employees spread globally over 21 locations is in need of STRONG, AMBITIOUS & MOTIVATED individual as follows.... - Lead the **design** and analysis of engineering projects - Coordinate engineering projects with other departments and/or divisions - Develop... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Detroit	**Mechanical Engineer**	Bose Corporation		05/25

...Music System components into new vehicle **designs**. You will coordinate communication and...will be responsible for the mechanical **design** and development of audio system components...will conceptualize, evaluate and present **design** alternatives that satisfy engineering... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Detroit	**Audio Systems Engineer**	Bose Corporation		05/24

...will work closely with Product Managers to conceive, **design** and prototype premium automotive audio systems offering...acoustic evaluation of system performance, system **design** using in-house **design** tools, as well as managing the **design** process and... [more]

Experience Required: Less Than 1 Year Employee Type: Full-Time

MI-Detroit	**AUTOMOTIVE SUPPLIER OPENINGS**			05/23

...Technical Center. The following positions are currently being sought & require Automotive Interior experience in Cut & Sew seating **design** & assembly. - Plant Manager - JIT - Quality Manager - Quality Engineers - Logistics Manager - Cut & Sew Specialists - Engineers... [more]

Experience Required: None Specified Employee Type: Full-Time

MI-Northern Suburbs	**Resident Engineer - mobile communications automotive**	Technology Resource Group	$60K - $75K	05/23

...to release parts into Customer's system (EWO's, ECP's and BSD's). * Investigate and recommend **design** and packaging alternatives; participate in **design** reviews; participate in FMEA process; recommend additional development and testing activities... [more]

Experience Required: At Least 3 Years Employee Type: Contractor

MI-Detroit	**TOOLING ENGINEER**	Tower Automotive		05/23

...5-10 years experience in automotive stamping **tool** & die - **Tool** & Die Journeyman status or Bachelor of Science Degree in Industrial...Dimensioning and Tolerancing - Ability to follow tools from **design** through implementation - Attention to detail to facilitate engineering... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Detroit	**Weatherstrip Guru**	Aerotek Automotive		05/23

...responsible for development and implementation of sealant product **design** throughout entire vehicle. Also will work with plants to assure...have 3 plus years of vehicle sealing experience and product **design**/development experience. Program launch and FEA experience is... [more]

Experience Required: None Specified Employee Type: Full-Time

MI-Detroit	**Product Engineer**	Aerotek Automotive		05/23

...responsible for development and implementation of sealant product **design** throughout entire vehicle. Also will work with plants to assure...have 3 plus years of vehicle sealing experience and product **design**/development experience. Program launch and FEA experience is... [more]

Experience Required: None Specified Employee Type: Full-Time

MI-Southfield	**Engagement Manager - Technology**	Jefferson Wells		05/22

...the Detroit area, we need high caliber, experienced Technology Professionals to join our team. Primary Responsibilities: * **Design** and develop implementation plans for enterprise network projects * Assess production network technologies and streamline management... [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Warren	**AutoCAD Designer**	Manpower Professional	$16.00 - $20.00/Hr	05/22

...ordering materials for various projects. Job Title: AutoCAD **Designer** Primary Skills: AutoCAD; 3-D Job Industry: Automotive Vacancies...Detailed Job Duration: unknown Degree Type: AA Degree Area: **design** Experience Minimum: 1 Year Candidates responding to this posting... [more]

Experience Required: At Least 1 Year Employee Type: Contractor

MI-Troy	**Software Eng**	Siemens Automotive		05/22

...engineer shall be responsible for the software **design** and development in the Engineering Department for...necessary. Develop software concepts, perform software **design** and implement software **design**. **Design** and perform certain software testing, verification... [more]

Experience Required: At Least 1 Year Employee Type: Full-Time

MI-Southfield	**Systems Engineer Sr Stf**	Lockheed Martin Corporation		05/21

...effectiveness analyses for total systems. Analyses are performed at all levels of total system product to include: concept, **design**, fabrication, test, installation, operation, maintenance and disposal. Ensures the logical and systematic conversion of customer... [more]

Experience Required: Not specified Employee Type: Full-Time

MI-Statewide	**Product Development Engineer**	FPC of South Bend		05/21

...work directly with the OE customer on developing new interiors for future model years from concept to manufacturing. You will oversee and work with other team members in product development, **design**, and tooling in preparation for mass production. [more]

Experience Required: More than 5 Years Employee Type: Full-Time

MI-Rochester	**Research & Development Engineer**	Manpower Professional		05/21

...skills a must. Familiarity with lab procedures, knowledge of **design**, development and test engineering. BS in Engineering (mechanical...Job Title: Research & Development Engineer Primary Skills: **design**; development; research; testing Job Industry: Automotive Vacancies... [more]

Experience Required: At Least 3 Years Employee Type: Contractor

MI-Lansing	**Tooling Engineer/Specialist**	Spherion, Making the Workplace Work Better	$40K - $40K	05/21

...Tooling Engineer/Specialist. Candidate will be responsible for setting up and maintaining the **tool** crib; leading the Tooling Technicians with **tool** life analysis, communication with set-up and production personnel, along with determining inventory... [more]

Experience Required: Not specified Employee Type: Full-Time

MI-Holland	**AutoCad Drafter**	Manpower Professional	$12.00 - $15.00/Hr	05/21

Holland based company searching for a **Designer**/Drafter proficient in AutoCAD 2000, knowledge of CNC or point-to-point. Qualified candidate should possess: 1-2 years of... [more]

Experience Required: At Least 1 Year Employee Type: Contractor

MI-Lansing	**Manufacturing Engineer - ATS**	Spherion, Making the Workplace Work Better	$40K - $40K	05/21

...experienced manufacturing engineer to provide support to the **design** and build of machining equipment, fixtures, gages and tooling; write line up specifications for new equipment purchase; follow **design** and build to maintain cost, delivery, quality, and functionality... [more]

Experience Required: Not specified Employee Type: Full-Time

programming using selected development tools, (currently...to UML - the ability to understand and help create technical **design** documents Please fax resume with salary requirements to: 734... [more]

Experience Required: Less Than 1 Year **Employee Type:** Full-Time

MI-Detroit **INJECTION MOLDING ENGINEERING** Mayco Plastics

...opportunities: Manufacturing Engineer: Hands on role, cell **design** and layout, assist with the APQP process and plant launch activitIES...machines, maintain process records, support production and conduct **tool** tryouts. MOLDING SUPERVISORS: Able to process and adjust molding... [more]

Experience Required: At Least 1 Year **Employee Type:** Full-Time

MI-Detroit **PROCESS ENGINEER** Alcoa Automotive

...clearly defined deliverables. Prior manufacturing experience with aluminum is a plus. The primary role includes leadership in the **design** and implementation of Alcoa Production System initiatives, leading process improvement projects for current production programs... [more]

Experience Required: At Least 3 Years **Employee Type:** Full-Time

MI-Farmington Hills **Cognos Developer** Comprehensive Systems

Create Business Intelligence reporting applications using the Cognos **tool** suite. Required skills include CLIENT/SERVER,UNIX SCRIPTS,COGNOS IMPROMPTU,COGNOS POWERPLAY,VERY GOOD INTER PERSONAL SKILL,GOOD... [more]

Experience Required: At Least 3 Years **Employee Type:** Contractor

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