PRODUCT DESIGN ENGINEERING TECHNOLOGY

BACHELOR OF SCIENCE PROGRAM

SELF STUDY

FOR

ACADEMIC PROGRAM REVIEW

Ferris State University
College of Technology
Mechanical Design Department

September 2000

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PROGRAM REVEW PANEL

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SECTION 1

OVERVIEW

A. GOALS AND OBJECTIVES OF THE PROGRAM

The mission of Ferris State University is to be a national leader in providing opportunities for innovative teaching and learning in career oriented, technological and professional education. Consistent with the mission of the University, the Product Design Engineering Technology program has the objective of providing a comprehensive education in mechanical design equal to the demands of today's industrial environment while preparing the graduate for the technical challenges of tomorrow's workplace.

B. PROGRAM HISTORY

The Product Design Engineering Technology program at Ferris State University was developed to be a two year Bachelor of Science degree path for students already possessing a two year Associates degree in certain specific areas related to mechanical design and/or manufacturing. The program enrolled its first students in the Fall of 1988. These students later became the first graduating class in May 1990. Shortly after the introduction of the program on campus in Big Rapids, the program was offered in a three year evening format at the Applied Technology Center in Grand Rapids. The off campus program was an immediate success as a path to career development among working industrial designers in the West Michigan area.

At the time of its creation, the Product Design program was staffed by two full time faculty members who were responsible for teaching all program courses as well as performing necessary administrative and advising functions for all students enrolled in the program. The Product Design program has an official maximum enrollment of 30 students in each on campus class year. Historically the program graduates approximately 25 students each year and therefore the typical on campus enrollment is approximately 50 students. Off campus enrollment is more difficult to measure but is typically 30 students at any given time. Since the creation of the program enrollment has been essentially stable.

In 1996 the senior faculty member of the Product Design program accepted what was anticipated to be a short term assignment as Acting Dean of the College of Technology. Eventually this assignment was extended through the end of Winter semester 1998. During this period, except for an occasional class taught by the Acting Dean, the Product Design program was the responsibility of one faculty member who taught most program courses, supported the PDET student organization, coordinated the program's Industrial Advisory Board, performed all program administrative functions and served as faculty advisor to typically 80 students both on campus and in Grand Rapids. In 1998 the Acting Dean returned to program faculty but was granted a one year leave of absence. This prevented hiring a replacement faculty member for the 1998-1999 school, forcing the Product Design program to staff several courses with adjunct faculty. In July 1999, the program received the resignation of the faculty member scheduled to return from the leave of absence and completed an unsuccessful search for a replacement. In September 1999 a new search was initiated but was suspended due to a reorganization within the College of Technology. In May 2000 a new search was initiated and resulted in the hiring of Associate Professor Koepf to begin effective Fall semester 2000.

C. CURRENT STATE OF THE PROGRAM

To date the Product Design Engineering Technology program has graduated approximately 250 Product Design Engineers who are employed by approximately 200 different employers, primarily in the Western Michigan area.

The graduating class of May 2000 enjoyed an unprecedented number of employment offers and produced the highest salary levels in program history. The average starting salary level for several class members exceeded that of the Product Design program faculty. Enrollment for the Fall 2000 semester was very competitive and produced an entering Junior class of 26 students. Currently the program has two full time faculty members (listed by year of hire);

Richard Goosen, MSEE, PE	1993
William Koepf, BS PDET	2000

The program at the Applied Technology Center in Grand Rapids continues at a stable enrollment level and is currently one of only two Bachelors of Science degree programs offered at that facility by the College of Technology.

The program continues to be one of the most cost effective in the college of technology. The expense budget allocation for the Product Design program is $5,400 above faculty salary allocation for the 2000-2001 FY. This is less than 50% of the next lowest cost program in the college. The program is based in a single classroom in the Swan Building. This room was remodeled by the program at its own expense in 1999 using funds from an outside donor. The program has no dedicated design studio or laboratory space.

The course offerings which make up the Product Design program have been relatively unchanged since the initial development of the program in 1988. The classes which make up the program are shown on the Curriculum Guide Sheet provided in Appendix A. The program is unique on a national level both in name and in content. The only program in the United States similar in name and approximate focus is the Product Design degree program offered by Stanford University.

D. PROGRAM INITIATIVES

There are several small initiatives which are currently in process within the Product Design Engineering Technology program. A short summary of these initiatives, identified as elements of the program's Unit Action Plan for 1999, are;

- More effective program recruiting of Associates degree graduates from Michigan community colleges to restore and then increase the level of transfer student enrollment in the program.
- The development of a dual degree program with Kendall College in Grand Rapids. This would enable Ferris State to offer students the unique opportunity to complete a BS degree in Product Design and a Bachelors in Fine Arts (BFA) degree in Industrial design in five years.
- The development of unique company sponsored degree completion programs for manufacturers in the greater Grand Rapids area. These would allow experienced mechanical designers to complete a Product Design degree in their own facility.
- The integration of Pro-Engineer design software within the Product Design program. Experience with this industry standard software will enable future program graduates to develop more job offers and higher salaries from employers.

E. SUMMARY

Participation in the Academic Program Review process provides an opportunity for the Product Design Engineering Technology program to describe and quantify its unique contribution to Ferris State University and the College of Technology. With its low costs and its relatively insignificant facility requirements, the program has previously lacked the visibility necessary to prompt the improvements and investments required by all successful academic programs. This review will clearly show the unique nature of the program and the exceptional opportunities it has for expanding its enrollment and becoming a national leader in design technology.

SECTION 2

GRADUATE SURVEY

A. INTRODUCTION

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

The Ferris State University Alumni office was able to provide the names and addresses for 166 of the approximate 200 Product Design graduates from the initial 1990 class through the class graduating in May 1998. The unavailability of alumni information for the 1999 and 2000 graduating classes was not thought to be a significant limitation since these classes have not yet accumulated adequate marketplace experience to effectively evaluate the program. A cover letter and survey instrument were developed to obtain several information elements from the responding graduate without requiring a significant investment of time. The survey was mailed with a self-addressed, stamped envelope enclosed. Of the 166 surveys mailed there were 4 returned undelivered. A total of 63 responses were received for a 39% response rate. This does not include several responses which were received to late to be included in the survey results. The response rate would seem to indicate that there is a remarkably high level of interest in the program among the graduate community.

The survey instrument is provided in Appendix B.

B. SURVEY RESULTS

The survey asked a number of questions using several formats. A discussion of the results of the survey for each question is provided in this document. The results are summarized in bold on the survey instrument shown as Figure 2-1. Note that, where necessary, the number of responses to a specific question are shown. This is required since some responding graduates did not answer all questions. Also note for some questions, more than one response was allowed and tabulated.

Figure 2-1 GRADUATE SURVEY RESULTS

About Yourself

Note that this information will be collected and used by the Product Design Program without identifying you personally. Your identity will be considered confidential and not released outside of the Product Design Program.

1. Name (Note; You can ignore questions 1-4 if you attach a current business card);

2. Company you currently work for;

3. Title; **166 surveys were mailed, 4 undelivered, 63 returned**

4. City and zip code where you work;

5. What year did you graduate from the Design program? **62 Responses**
1990-5, 1991-2, 1992-6, 1993-6, 1994-5, 1995-11, 1996-9, 1997-7, 1998-11

6. What was your Associates Degree area of study and where did you earn it? **62 Responses**

FSU CDTD	FSU MET	OTHER FSU (TI etc)	TRANSFER
14	13	4	31

7. Did you take most of your courses (circle) ON CAMPUS or OFF CAMPUS
62 Responses **54** **9**

8. Have you completed any college coursework since leaving FSU? If so, what was your area of study / program and which college or university did you attend.

63 Responses **Yes – 19** **Graduate Schools Attended; RIT, WMU, UM, Wayne State,**
No-37 **GVSU, Kettering Univ.**

9. What was your starting annual salary in dollars after your graduation (optional - please circle one)

15 – 20,000 21 - 25,000 26 – 30,000 31 – 35,000 36 – 40,000 41 – 45,000

46-50,000 51-55,000 more than 55,000 **See Tabulated Results**

10. What is your current annual salary in dollars (optional - please circle one)

15 – 20,000 21 - 25,000 26 – 30,000 31 – 35,000 36 – 40,000 41 – 45,000

46-50,000 51-55,000 56-60,000 61-65,000 66-70,000 71-80,000

81-90,000 Greater than 90,000 **See Tabulated Results**

11. Circle the category (or more than one) that best describes your current position;
56 Responses

Design **27** Technical Management (of an engineering dept. or section) **9**

Sales/Marketing **4** General Management (of a facility, company, division, etc) **5**

Project/Product Management **27** Other _____**6**_____

Figure 2-1 (continued)

About Your Product Design Education

12. In your opinion, based on your experiences since graduation, to what extent did the specific subject areas of the Product Design academic program prepare you for employment. Indicate your opinion next to the subject area according to the following scale;

5 – Very Important
4 - Somewhat important
3 - Neutral or I did not take this subject
2 - Of marginal value
1 - Of no value

4.1 Advanced GD&T	**4.1** Plastics Material Selection	**3.6** Advanced Composition
4.2 Statics and Strengths of Matls	**3.0** Applied Calculus	**4.1** Technical Presentations
2.6 Chemistry	**4.1** Machine Design	**3.7** Finite Element Analysis
2.6 Art	**2.7** Psychology	**3.5** Testing Systems
3.8 Dynamics	**3.3** Thermodynamics	**4.1** Senior Design Project
3.6 Model & Prototyping	**4.2** Metals Materials Selection	

Average of all Rated Courses – 3.6 Responses - 62

Your Opinions on Miscellaneous Topics

13. In your opinion what was the most valuable aspect of the PDET program. This may be a course (or courses) or a general aspect of the program (such as "applied problem solving").

Courses rated as most valuable – Senior Project, Machine Design, Plastics Materials Selection, Statics & Strengths of Materials
(Listed in Order; most valuable first)

14. In your opinion what was the least valuable aspect of the PDET program.

Courses rated as least valuable – Art, Testing Systems, Psychology, Advanced Composition
(Listed in Order; least valuable first)

15. Did you have a difficult time finding your first job after graduation (circle the level of difficulty) ?
Average of 62 Responses – 1.94
1 No Difficulty *2 3 4 5 Very Difficult

16. Overall are you satisfied with the PDET education you received at FSU ? (circle)
Average of 62 Responses – 1.92
1 Very Satisfied *2 3 4 5 Completely Unsatisfied

17. Many engineering programs are now accredited by a national engineering organization (ABET). The current PDET program is not ABET accredited. To become accredited under ABET rules the program would be required to add a second Calculus course. This would require the elimination of some aspect of the current program of study. In your opinion (check your selection);

47 ABET accreditation is a good idea. To add another calculus course, the program should eliminate;
61 Responses **Most Recommended to drop - ART**

14 ABET accreditation is not a good idea or worth changing the program to achieve.

Figure 2-1 (continued)

18. Based on your experience, what professional organization would you recommend for PDET students to join before graduation (Note; currently many PDET students become SAE members).

24 None **36** I recommend **SAE – 22, ASME – 7, SPE – 4, ASBE – 3**

19. In your opinion how important to a product designer is the ability to create renderings and sketches of products by free hand drawing?

2 Not important at all
4 Product rendering ability is useful but there is no need to create these drawings free hand
32 Useful but not critical
20 Very Important

20. In the space below please identify any changes or additions would you recommend for the PDET program and /or provide any general comments that you would like to have evaluated.

44 of 63 Returned Surveys included comments.

Please return this survey using the addressed, stamped envelope provided. Try to return your response by July 19, 2000.

Thank you for your help in evaluating the Product Design Program.

Response Evaluation by Question;

Question 1 through 4: These questions were used to identify the responder with about 80% providing at least some information. The results from this section will be used to update the alumni database

Question 5: There were 62 responses to this question. The breakdown by class was;

1990 – 5	1991 – 2	1993 – 6	1994 – 5
1995 – 11	1996 – 9	1997 – 7	1998 – 11

Question 6: There were 62 responses to this question. The breakdown shows that 50% of the respondents had entered the Product Design Program after completing an Associates degree at an institution other than Ferris State. This shows the dependency of the program upon external recruitment and the basis of concern in this area (see Section 10 – Enrollment).

Question 7: The results of this question show that the overwhelming number of respondents were graduates of the full time, on campus program.

Question 8: Responses to question 8 indicate that 19 of 63 responding program graduates have taken graduate courses and/or a graduate degree program since graduation. Although several universities were mentioned in the responses, the most commonly mentioned program was the Masters of Engineering Management program at Western Michigan University. It was also noted that the most commonly listed areas of study were management and business rather than engineering graduate programs.

Question 9 and Question 10: The responses to these questions regarding annual compensation are summarized and presented in Table 2-1. The data from responding graduates indicates moderately high starting salaries consistent with labor market data (see Section 7). The table also shows that Product Design Program graduates have enjoyed large annual salary increases ranging from a 6.8% average for 1991 graduates to a 12.5% average for the more recent classes of 1997 and 1998. Overall the composite average annual salary increases for program graduates is 10.5% over the nine class years surveyed.

Table 2-1 Alumni Salary Survey Summary

(Survey Questions 9 & 10)

Grad. Year	# Responses	Avg. Starting Salary	Avg. Current Salary	Years since Graduation	% annual change
1990	5	27,800	68,400	10	9.40%
1991	2	30,500	55,500	9	6.80%
1992	6	29,700	67,300	8	10.70%
1993	6	30,500	55,500	7	8.90%
1994	5	25,400	50,500	6	12.10%
1995	11	33,500	55,900	5	10.70%
1996	9	31,700	47,400	4	10.60%
1997	7	40,100	57,100	3	12.50%
1998	11	37,100	47,000	2	12.50%
Total Resp.	62			Average of all Years	10.50%

Question 11: The responses to question 11 indicate that the responding Product Design graduates are equally divided in their job functions with approximately half the responses identifying a Design function and the other half indicating a Product / Project Management role. This shows a normal professional development towards management responsibilities by graduates as they gain experience in the workplace.

Question 12: The results of the survey indicate that program graduates believe the following courses in the Product Design program were the most important;

Statics & Strengths of Materials	Advanced GD & T
Materials Selection – Metals	Machine Design
Senior Design Project	Materials Selection – Plastics
Technical Presentations	

The results of the survey indicate that the following courses are considered the least important for employment by program graduates;

Chemistry	Art	Psychology

It should be noted that three courses from the program curriculum were omitted due to error. These courses were; Electronics, Design for Manufacturing and Statistics & Ergonomics.

Question 13: In general the results for question 13 indicated the same perceived value of specific courses from the program as shown in the responses to question 12. Of the responses not referring to a specific course the most common comments were in support of the focus on practical applications within most PDET coursework. The graduates reported that they believed that they were able to make significant contributions in their assignments faster than graduates from four year engineering programs. They also in general felt that they were better prepared overall for their work than graduates from other schools.

Question 14: In general the results for question 14 indicated the same perceived value of specific courses from the program as shown in the responses to question 12. Of the responses not referring to a specific course, the most common areas of concern were in the area of general education requirements with some graduates believing that this part of the program would be better served by additional technical coursework.

Question 15: Program graduates indicated that they had little difficulty in finding employment after graduation.

Question 16: Program graduates indicated that they were satisfied with the education received in the Product Design program at Ferris State.

Question 17: This question was included to evaluate the desirability of seeking ABET accreditation for the Product Design program. Although the responses indicated strong feelings both pro and con, an overwhelming number of graduates (47/61 responses, 77%) thought that ABET accreditation would be desirable. It should be noted, however, that many responses indicated confusion among graduates about accreditation and the division between engineering and engineering technology programs. It appears that many of the perceived limitations identified by graduates were really characteristics of an Engineering Technology program and unrelated to accreditation status. An exception to this, however, is that several graduates reported difficulty due to a lack of accreditation in pursuing graduate degrees and professional registration.

Graduates supporting accreditation generally recommended to drop the ART course to add the required calculus course.

Question 18: This question was included to determine if graduates believed that student affiliation with a national professional organization was worthwhile. Of 60 responses, over half of the graduates indicated that a professional affiliation was worthwhile and overwhelming number of those responses indicated that the Society of Automotive Engineers (SAE) was the best choice.

Question 19: This question was included to evaluate the need for drawing and rendering skills for Product Designers. Approximately one third of the respondents thought that these skills were Very Important and additional half of respondents believed these skills were "useful but not critical". Only 6 of 58 responses indicated that drawing and rendering skills were not important. Note that these skills are currently taught in the basic ART course in the program. This implies that while students see the ART course has having little value, they recognize a need for the skill objective of the course.

Question 20: When graduates were offered the opportunity to provide general input about the Product Design program, 44 of 62 responses provided written comments. These responses ranged from specific formal recommendations of several pages in length to simple handwritten notes of support. Because of the volume of these responses they have not included in this report. The responses have been used in interpreting the survey results and they will be used in the future to direct program changes. All Graduate Survey responses have been retained on file for review as necessary.

C. SUMMARY

The Graduate Survey information is impressive in the volume of response and in the quality of information produced. The high number of responses and the number of written comments indicate that Product Design Program graduates are interested in remaining involved with the program and have a high degree of program identification. The survey provides clear indications of the strengths and weaknesses of the program as perceived from a graduate point of view. In some cases changes such as ABET accreditation and the art portion of the curriculum must be considered.

Overall this survey indicates that graduates of the Product Design program enjoy excellent employment, compensation and career growth opportunities. They are, as a group, well satisfied with the professional preparation provided by the program.

SECTION 3

EMPLOYER SURVEY

A. INTRODUCTION

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

There have been various methodologies employed as part of the program review process at Ferris State. One approach is to survey only employers of graduates. This approach typically provides information based on a very limited sample of graduates known to the reviewer and is often less than objective. A second approach that has been used is to identify potential employers who are likely to employ or to have employed program graduates. This approach is better in that it allows the reviewer to assess the program rather than one or two graduates. The second approach is limited, however, in that employers without a direct contact with the program typically fail to respond. Historically it has been the experience of the academic programs with the College of Technology both survey approaches produce a poor rate of response.

In developing the employer survey for the Product Design program, a different approach was utilized. For the last five years, the Product Design faculty has maintained a "scrapbook" of job advertisements taken from various publications in the West Michigan area. This collection of advertisements provides a multi-year cross section of all employers who have solicited for a position description matching the skills stressed in the Product Design program. This data base of several hundred advertisements was screened to provide a list of most likely employers and to provide a variety of industries, positions and locations. Using the list of employers developed from the master database, telephone calls were made to targeted respondents. During each call the best potential reviewer at each employer was identified and alerted as to the purpose of the survey. From this information, 50 survey forms were mailed to specifically identified and alerted employers using verified address information.

From this mailing, a total of 22 responses were received representing a 44% response rate. While this rate seems low, given the amount of advance coordination made, it is a significantly higher rate of return and number of responses than is typical for such surveys.

The mailing list for the Employer Survey and a copy of the survey instrument with typical cover letter is provided in Appendix C

B. SURVEY RESULTS

The survey asked a number of questions using several formats. A discussion of the results of the survey for each question is provided in this document. The results are summarized in bold on the survey instrument shown as Figure 3-1. Note that, where necessary, the number of responses to a specific question are shown. This is required since some responding employers did not answer all questions. Also note for some questions, more than one response was allowed and tabulated.

Figure 3-1 EMPLOYER SURVEY RESULTS

Ferris State University Product Design Engineering - Industrial Survey

1. Approximately how many employees work at this facility ?
   Smallest – 8 employees **Largest – 1850 employees** **Average – 616 employees**
2. Approximately how many Mechanical engineers / designers work at this facility ?
   Smallest – 0 designers **Largest – 250 designers** **Average – 29 designers**
3. What description best fits your company's primary activity ? (check all that apply)

   15 Manufacturing **12** Design **1** Consulting **1** Other Corporate headquarters

4. Does the company currently have a Ferris State University Product Design graduate on staff ?
   19 Responses

   9 Yes **7** No **3** Unknown

5. If so, how well do you feel that the Ferris State graduate(s) was/were prepared to work for your company?
   22 Responses

Very well prepared	About Average	Not prepared	Not Applicable
4	**5**	**0**	**13**

6. The following are the major subject areas in Ferris State University's Design Engineering program. Please indicate the relative importance you feel that this subject / skill would have if you were seeking to hire a recent graduate for your technical staff.

   5 – Very Important
   4 - Somewhat important
   3 - Neutral or I am not familiar with this subject
   2 - Of marginal value
   1 - Of no value

4.4 Geometric Dimensioning and Tolerancing (GD&T)	**4.2** Machine Design
4.3 Basic Material Science	**3.2** Thermodynamics
3.9 Designing with Plastics	**3.3** Fluid Mechanics
4.1 Designing with Metals	**3.6** Basic Electronics
4.2 Engineering Statics	**4.6** CAD surfacing & 3D modelling
4.2 Engineering Dynamics	**4.3** Ergonomics
21 Responses	
2.8 Chemistry **Average Rating - 3.8**	**3.5** Statistics
3.7 Physics	**3.6** Product rendering & sketching
4.0 Finite Element Analysis (FEA)	**2.6** Manual Drafting
4.1 Failure Mode Effects Analysis (FMEA)	**2.8** Industrial Psychology
4.8 Design for manufacturing	**2.9** Applied Calculus

Figure 3-1 (continued)

7. Approximately what percentage of your new engineering drawings are developed in CAD (as opposed to being developed by manual drafting) ?

Avg - 99.4% **18 responses** **15 of 18 responded 100%**

8. If you currently develop CAD based drawings, what software package do you use ? (If you use more than one indicate the relative percentages used for new product development.)

21 Responses

10 AUTOCAD **6** PRO-E **4** CATIA **5** UNIGRAPHICS

____ OTHER (Please Specify) **5-SDRC** **2-PGDS** **2-Solidworks** **3-Mech. Desktop**

9. All Product Design students at Ferris State are required to complete an individual design project during their senior year. This project consists of the design of a new product or the major modification of an existing product. Students are required to submit a technical proposal describing the design objective and justification for their project. In order to have their proposal accepted, they must also submit a reasonably detailed time and material budget for each planned design task. Once the proposal is accepted, the project is directed and managed by the student with only periodic status reports required. At the end of their senior year each student is required to provide a formal written technical report describing their project and a model or prototype of their design. Each student is then required to make a formal presentation about the project to the faculty.

Overall does this seem to be a worthwhile activity ? **4.9** (5-very worthwhile ... 1-not important)

The specific skills intended to be developed by completing the senior project are listed below. Using the same scale as used for question 6 (i.e. 5-very important ... 1-not important), please rate the relative importance that you would place on each skill.

4.6 Proposal Preparation (including concepting and estimating)

4.2 Written Status reporting **4.7** Project management

19 Responses **Average Rating 4.4**

4.1 Formal written report **4.6** Prototype development

4.4 Technical Presentation

10. During the last year has your company experienced difficulty in hiring qualified mechanical designers?

13 Yes **3** No **3** Do not know / Not applicable **19 Responses**

11. In your opinion, describe the growth potential for mechanical design at your company during the next year. (circle the best estimate)

19 Responses

Probable expansion in design staff				Average/Steady		Probable reduction in staff	
7 of 19	5	**9 of 19**	4	**3 of 19**	3	2	1

12. In the space below please identify any changes or additions would you recommend for the Product Design program at Ferris State University and /or provide any general comments that you would like to have evaluated

14 of 19 Responses had additional comments

Thank you for your help in evaluating the Product Design Program.

Response Evaluation by Question;

Question 1: The number of employees in the facility of the reviewing employer ranged from 8 to 1850 employees with an average of 616 employees.

Question 2: The number of *mechanical* engineers and/or designers *in the facility* of the reviewing employer ranged from 0 to 250 with an average of 29 mechanical designers.

Question 3: The survey indicated that nearly all responding employers were involved (almost equally) in manufacturing or design.

Question 4: Only nine of nineteen employers reported having a Product Design program graduate currently on staff.

Question 5 Of the employers with a Product Design graduate on staff, all described the graduate as either "Very Well Prepared" or "About Average". No "Not Prepared" ratings were given.

Question 6: The results of the survey indicate that employers believe the following courses in the Product Design program are the most important;

Advanced GD & T	Engineering Statics
Basic Material Science	Machine Design
Engineering Dynamics	Design for Manufacturing
Senior Design Project	CAD Surfacing & 3D Modelling
Ergonomics	

The results of the survey indicate that the following courses are considered the least important by employers;

Chemistry Manual Drafting Psychology Applied Calculus

Overall employers rated the courses in the Product Design Curriculum as 3.8 on scale of 5.0. This equates to an overall "Somewhat Important" rating.

Question 7: Question 7 was intended to assess the role of Computer Aided Design in the current workplace. The employers indicated an average of 99.4% of all design drawings are now completed using CAD. 15 of 19 responding employers indicated all new drawings were being developed on CAD.

Question 8: Employers indicated that currently the most popular software packages for CAD are AUTOCAD and PRO-Engineer. It should be noted that there were a variety of other software packages identified and many employers indicated that they currently use more than one package.

Question 9: This question was intended to assess the specific elements currently required in the Senior Design project for the Product Design Program. This course is a "capstone" course intended to bring the various skills acquired through program courses together to complete a significant individual design project. Overall employers rated this activity as 4.9 on a scale of 5.0 giving the activity the highest possible rating ("Very Worthwhile").

All individual elements of the senior project were rated highly by the employers with the most important single category being Project Management.

Question 10: Thirteen of nineteen responding employers reported difficulty in hiring qualified mechanical designers during the last year. This is consistent with the high demand for designers identified in the Labor Market Analysis (see Section 7).

Question 11: All employers responded that they expect their need for mechanical designers to remain steady or increase during the next year. Most employers seemed to indicate that they expect a moderate increase in design staff and no employers expect a reduction in staff.

Question 12: When employers were offered the opportunity to provide general input about the Product Design program, 14 of 19 replies provided written comments. These responses were uniformly positive in nature but did not consistently identify any area for improvement or change. The responses will be retained for future use in directing program development where applicable.

C. SUMMARY

The Employer Survey provided little new information for the program beyond that available from other sources. Overall the current Product Design Curriculum seems to be well supported by employers. The individual course ratings generally mirror those of students and alumni. The Senior Project is especially highly rated by employers. Employers indicated that the conversion to computer aided documentation development from manual methods is nearly universally complete. The software package indicated as the most used in industry is currently the standard in the Product Design program and the second most popular is planned for program introduction in the Winter 2000 semester. Employers indicated an expected healthy demand for program graduates and the difficulty they reported in hiring new mechanical designers should guarantee attractive salaries for the immediate future.

SECTION 4

STUDENT EVALUATIONS

A. INTRODUCTION

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

In early 1997, a commitment was made by the Product Design program faculty to develop a survey instrument to assess the effectiveness of instruction for the program. Prior to that time there was no comprehensive student assessment information available for PDET program courses and the supporting courses of the program. A suitable instrument was developed and first used in May 1999 for the graduating Senior class of 1999. The Junior class was not included in the interest of efficiency since there was thought to be limited insight available from students with less than a year in the program.

The results of this survey have been used to identify courses that are identified as problem areas by the students. Each problem area is investigated in order to find the basis for the perceived problem. Changes in course texts, assigned instructor, course content and even scheduling issues have been identified and used as a basis for special monitoring or immediate action.

The survey instrument appears in Appendix D.

B. SURVEY RESULTS – SENIOR CLASS, ON-CAMPUS, May 1999

The results of the May 1999 survey were as follows;

Sample Size 24 students out of 25 students responded.

Overall satisfaction rating of the PDET program

(Average of all responding students with a score of 5 indicating "Very Satisfied" and a score of 0 indicating "Not Satisfied")

Satisfaction index = 4.2

Program Courses with best overall value as perceived by students

Classes rated 4 or 5 on the scale of 0-5 by 10 or more students. *(Number indicates number of students ranking the course as 4 or 5).*

PDET 411 Machine Design (22)
MECH 240 Statics & Strengths of Materials (17)
PDET 499 Senior Project (14)
PDET 413 Thermodynamics (14)
ENGL 321 Advanced Technical Writing (14)
PDET 312 Advanced GD&T (12)
PDET 321 Dynamics & Kinematics (12)

Program Courses rated as best overall course in the program as perceived by students
(Number indicates the number of students who indicated the course as the best)

PDET 413 Thermodynamics (11)
PDET 411 Machine Design (9)
PDET 499 Senior Project (9)
MECH 240 Statics & Strengths of Materials (3)

Program Courses rated as worst overall course in the program as perceived by students
(Number indicates the number of students who indicated the course as the worst)

PDET 412 Statistics & Ergonomics (8)
COMM 336 Technical Presentation (4)
EEET 318 Electronics for PDET (4)

Meaningful Comments from the Survey: Only four of 24 responses provided meaningful suggestions. The comments did not identify any common issues.

Analysis: Students were generally well satisfied with the PDET program. PDET students attached a very high value to technical coursework with high application content. Most remarkable is the ranking of Thermodynamics as a course perceived as having a high value by the largest number of students. Less popular courses were generally courses with specific instructional problems or courses taken to meet General Education Requirements. The courses perceived as the worst in the program were generally rated as such due to dissatisfaction with the instructor. Based on these results the course under direct program control (PDET 412) was assigned to a different faculty member and revised to include a new text with a greater emphasis on Ergonomics rather than Statistics.

C. SURVEY RESULTS – SENIOR CLASS, ON-CAMPUS, May 2000

The results of the May 2000 survey were as follows;

Sample Size 12 students out of 18 students responded.

Overall satisfaction rating of the PDET program
(Average of all responding students with a score of 5 indicating "Very Satisfied" and a score of 0 indicating "Not Satisfied")

Satisfaction index = 4.65

Program Courses with best overall value as perceived by students

Classes rated 4 or 5 on scale of 0-5 by 7 or more students. *(Number indicates number of students ranking the course as 4 or 5).*

PDET 411 Machine Design (10)
PDET 499 Senior Project (10)
MECH 240 Statics & Strengths of Materials (9)
PDET 422 Advanced Machine Design with FEA (9)
PLTS 342 Plastic Material Selection (8)
PDET 413 Thermodynamics (7)
PDET 311 Seminar (7)
PDET 321 Dynamics & Kinematics (7)
HSET 403 Testing Systems (7)

Program Courses rated as best overall course in the program as perceived by students

(Number indicates the number of students who indicated the course as the best)

PDET 499 Senior Project (7)
PLTS 342 Plastic Material Selection (3)
PDET 411 Machine Design (3)
PDET 322 Model and Prototyping (2)
MECH 240 Statics & Strengths of Materials (1)

Program Courses rated as worst overall course in the program as perceived by students

(Number indicates the number of students who indicated the course as the worst)

EEET 318 Electronics for PDET (4)
PDET 412 Statistics & Ergonomics (3)
PDET 312 Advanced GD&T (3)
MFGE 352 Design for Manufacturing (3)

Meaningful Comments from the Survey: Four of 12 responses provided meaningful suggestions. The comments did not identify any common issues and largely amplified the need to improve the courses rated as "worst".

Analysis: Students remain well satisfied with the PDET program and continue to attach a very high value to technical coursework with high application content. The lower response rate for Winter 2000 was due to poor timing in issuing the survey. A large number of students were traveling on job interviews when the survey was completed. A significant improvement in student satisfaction with the Plastics course and a continuing increase in student satisfaction with the Advanced Machine Design course are notable. Significant instructional problems remain in the Electronics course. These will be addressed with the Electronics department. Some improvement was noted in PDET 412, however a continuing low ranking indicates the course requires continued monitoring.

D. SUMMARY

The results of the Student Evaluations from both the graduating classes of 1999 and 2000 are consistent in indicating that Product Design students are generally well satisfied with their education from the program. Both class years indicated a satisfaction index above 4.0 on a scale of 0 – 5 with 5 being the highest possible rating ("Very Satisfied"). Although individual course ratings varied year to year, both classes rated the core classes within the Product Design curriculum quite high in general. The classes included in the program for general education purposes were generally rated lower than the core classes.

SECTION 5

FACULTY PERCEPTIONS

A. INTRODUCTION

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

At the time of this survey the Product Design program consisted of a single faculty member. In order to make the results of the survey more meaningful than the opinion of a single individual, the survey was directed to those FSU faculty members who had direct experience in teaching and working with students from the program. This survey instrument was sent to the thirteen faculty members affiliated with the on-campus PDET program. Six responses were received, giving a response rate of 46 percent.

The survey instrument is provided in Appendix E.

B. SURVEY RESULTS

The survey asked five questions relating to the preparedness of the PDET students. The faculty were then asked to evaluate the importance of courses required for admission into the PDET program. A final open-ended question solicited suggestions on requirements that should be added.

Note; The rating scale used for the Faculty Perception Survey is different than the scale used for the other surveys completed as part of this report. For this survey all categories were rated on a scale of 1 to 5 with a rating of 1 being the best.

Faculty responses;

Question 1: *"I would describe the preparation of the typical PDET student for my course when compared to other members of the FSU student population..."*

The survey average was 2—slightly below "Better prepared"

Question 2: *"I would rate the written communication skills of the typical PDET student relative to those of other FSU students..."*

The survey average was 2.3—marginally above Average.

A comment on one of the surveys added: "Hand/eye drawing skills are strong."
Another comment stated: "They are prepared, but many have a bad case of 'senior laziness'." In explanation, the faculty member making this comment stated that he taught a senior level class offered in Winter semester when most of the students are in the process of job hunting and planning on graduation.

Question 3: *"I would rate the verbal communication skills of the typical PDET student relative to those of other FSU students..."*

The survey average was again 2.3—slightly above average.

Question 4: *"I would rate the quantitative skills of the typical PDET student relative to those of other FSU students ..."*

The faculty responses averaged 2—Above average.

Question 5: *"I would rate the problem solving skills of the typical PDET student relative to those of other FSU students..."*

The faculty responses averaged 1.6—close to endorsing these students as Better prepared.

Evaluation of Existing Admission Requirements:

In rating requirements using the check list, the faculty felt:

ENGL 150 & 250 or equivalent	Very Important
COMM 150/121 or equivalent	Very Important
PHYS 211 or equivalent	Very Important
MATH 126 or equivalent	Very Important
A basic CAD course	Very Important
A basic Materials course	Very Important
A Social Awareness course	Somewhat Important
A Cultural Enrichment course	Somewhat Important

Two surveys suggested requirements that should be added. These were

A two-dimensional studio course that would stress drawing perspective, rendering technique, and value/light study; also consideration of a three-dimensional studio course that would address 3-D design elements and the creative use of structural materials.

More written and oral communications as well as additional math and physics.

C. SUMMARY

The surveys rated PDET students better than "above average" with respect to the Ferris student population in the five preparation categories and strongly endorsed all curriculum areas except Social Awareness and Cultural Enrichment. It should be noted that Social Awareness and Cultural Enrichment courses are mandated by FSU general education requirements.

SECTION 6

INDUSTRY ADVISORY BOARD PERCEPTIONS

A. INTRODUCTION

Advisory committee perceptions: The purpose of this activity is to assess faculty perceptions regarding the following aspects of the program: 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.

Since 1993 there have been only sporadic meetings of the Product Design program Industrial Advisory Committee (IAC). This has been the result of limited faculty resources and instability in the program faculty. A meeting was held on March 15,1996 and then no other meetings occurred until June 10, 1999. The next meeting is planned for Fall 2000 and thereafter on an annual or biannual basis dependent upon program activity.

Prior to the 1999 meeting the IAC had 11 industry representatives. Based on a rather poor attendance at the 1996 meeting (5 of 11 attending), all members of the existing IAC were surveyed as to their level of interest and desire to remain an IAC member. Based on the results of this inquiry and prior attendance a new board of seven members was formed. The list of current IAC members is shown in Appendix F.

B. INDUSTRIAL ADVISORY COMMITTEE MEETING RESULTS

The most recent Product Design IAC meeting was held on June 10, 1999. Because of the time since the prior meeting and the number of new members present, it was necessary for the meeting to begin as a general informational session to familiarize / refamiliarize members as to the program and its current content. After this portion of the meeting, the following general areas of input were provided by the IAC.

1. The importance of communications (speaking and writing) in the engineering workplace was emphasized. The writing and presentation course content of the current Product Design program was noted and the program was given the recommendation to find additional ways to increase communications content within other courses in the curriculum.
2. The IAC was solicited for recommendations regarding the integration of student owned Personal Computers within the Product Design curriculum. It was recommended by the IAC that a student PC requirement would improve the program with the caveat that the price of hardware per student should be approximately $2000 or less and that suitable student software be identified. The IAC seemed to agree that implementation of PRO-E mechanical design software and ANSYS Finite Element Analysis software in addition to basic spreadsheet, wordprocessing and presentation software would be a reasonable starting point based on current industry useage.
3. The IAC expressed concern that the current Product Design program had only one full time faculty member assigned. The committee advised that it was critically important that any new faculty member have significant experience in the U.S. industrial design and manufacturing environment.

4. The IAC was solicited for input regarding ABET accreditation for the program. The majority of the committee seemed to feel that the current lack of accreditation was not an issue among employers. The committee also seemed to feel that the addition of an additional calculus course to meet ABET requirements would provide no benefit in "on the job" skills and they were not able to identify a suitable course to be eliminated in order to add the math course.
5. The current Product Design curriculum was presented to the committee and they provided no recommendations for change. General input with respect to the curriculum was that manual drafting skills were no longer of use in industry but that the current Computer Aided Drafting (CAD) content should be supported by the ability of the designer to create free hand sketches of design ideas.
6. The IAC toured the Swan computer facilities and the Product Design primary classroom without identifying any problem areas.

C. SURVEY RESULTS

To provide an opportunity for IAC members to provide individual input after the meeting, a survey instrument (see Appendix F) was provided to each member attending the meeting. The results were as follows; *(note – 5 = Excellent, 1=Poor)*

Question	Average Score
1. How would you rate the organization of this meeting?	4
2. How would you rate the receptivity and openness of the program faculty and staff?	4.5
3. How would you rate the luncheon and meeting facilities?	3.5
4. How would you rate the curriculum you reviewed and analyzed?	4

The responses provided for questions 1 through 6 expressed satisfaction with the meeting and its content. IAC members thought that adequate information was provided for their use in evaluating the program. The responses to question 7 ("How might we better serve you and your company in the future?") provided only two suggestions for the program. The first suggestion was to attempt to link the senior design project to a sponsoring company which would submit a design problem, support the student's design development and review/implement the results. The second suggestion was to include an exposure to ISO Quality Certification and Failure Mode Effects Analysis within some area of the Product Design coursework.

D. SUMMARY

The Industrial Advisory Board made several recommendations which have been considered in developing changes within the Product Design program. The board is positive and supportive of the program in general and is willing to assist the program in determining its future direction

SECTION 7

LABOR MARKET ANALYSIS

A. INTRODUCTION

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

A problem area in the analysis of employment trends for Product Design graduates is the selection of the correct statistical base. The profession of designing new products is typically reported in multiple categories. The most applicable categories are typically;

Mechanical Engineers – B.S. degree in Mechanical Engineering. Primarily concerned with the technical aspects of mechanical design and manufacturability.

Industrial Designers – Normally a B.F.A. degree. Concerned primarily with product appearance and functionality.

The Product Design program at Ferris State is a hybrid of the training required for these specialties. The program has less analytical content than a B.S. in Mechanical Engineering and much less art content than typical of Industrial Design. This unique nature of the Product Design program therefore required evaluating at least two skill categories of labor market data. Analysis was done on both the state and national level. The indicated trends developed from state and national sources was then compared to the placement data for new graduates from the FSU Placement Office in order to further evaluate accuracy. This allowed conclusions to be developed consistent with a variety of data sources.

B. STATE OF MICHIGAN LABOR MARKET ANALYSIS

The Michigan Department of Career Development (MDCD), Office of Labor Market Information provided the starting point in evaluating employment information for Product Design Graduates in the State of Michigan. The MDCD Occupational Employment Forecasts for the period from 1996 to 2006 provided the following applicable data;

OES Code		
22135	Mechanical Engineers	12.7%
34038	Designers, Ex. Interior	25.4%

Data from the Michigan Employment Security Agency estimates the growth for Mechanical Engineers as "Much Faster Than Average" with a 1999 salary range of $25,000 to $80,000 ($52,000 average). For the Designer category, this agency estimated a growth potential of "Much Faster Than Average" and a 1999 salary range of $18,000 to $72,000 ($45,000 average). This data is available from Michigan Career Outlook 2005 available from the MESA.

C. NATIONAL LABOR MARKET ANALYSIS

The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor provided three potential employment categories relevant to FSU Product Design graduates. These categories were Engineering Technician, Designers and Mechanical Engineers. A review of the description of the Engineering Technician category indicated that it primarily consisted of technicians with A.S. degrees. Although this category could include the Product Design B.S. graduate, the preponderance of A.S. level data invalidated the category for the purposes of this analysis. The Designer category description indicated that it contained a wide variety of designers in addition to the Industrial Design function most closely related to the Product Design program. The Mechanical Engineer category, while clearly intended to report statistics for individuals with B.S.M.E. degrees also would be a logical location for many Product Design graduates. Descriptions of the Mechanical Engineer and Designer categories are provided in Appendix G.

Mechanical Engineers. About 220,000 Mechanical Engineering jobs were available in 1998 with 60% of those positions in manufacturing related activities. The Bureau of Labor Statistics (BLS) projects a growth level "as fast as average" through 2008. This is based on a projected 16.4% increase during this 10 year period. With a median salary level of $53,290 reported in 1998 (VH-Very High Quartile), the average starting offer to new B.S.M.E. graduates was 43,300.

Designers. There were about 335,000 jobs in this category in 1998. Of this number the subcategories of Engineering Services, Manufactured Products, Motor Vehicles & Equipment, Furniture, Machinery and Metalworking amounted to about 10% of this total. These categories are most applicable to FSU Product Design graduates. With a projected 426,000 jobs projected for 2008, an 27.1% growth rate is predicted with a "faster than average" rating by the BLS. Overall the annual earnings in this quartile rate as high (H) relative to other job codes. Although an overall median earning level of $29,200 was measured for 1998, the Engineering subcategory (the category most closely aligned to FSU Product Design) was $41,300.

D. FSU PRODUCT DESIGN PLACEMENT OFFICE ANALYSIS

A salary history for the initial placement of Product Design and other College of Technology B.S. programs graduates is shown as Table 7-1. This information was extracted from the annual studies of graduates and their starting salaries prepared by the F.S.U. office of Career Planning and Placement. Product Design graduates have enjoyed starting salaries well above the FSU Bachelor Degree average and the data of Table 7-1 shows an average salary rank generally in the top half of the College of Technology B.S. graduates. Some important notes however must be included.

1. The data sample size for each year is typically quite small. Since there can be a significantly higher salary offered to the occasional graduate with significant experience, the data for a given year can be distorted. (Note at least four graduates must report a starting salary for an average to be calculated.)
2. The averages for the 1996 year were not provided. The value used is the mean of the high and low starting salary.
3. The average salary provided for the 1999 PDET graduating class is highly suspect. All known starting salaries for this class were well above the reported number. Based on the high demand for Product Designers in the 1999 class and from the salary distribution exhibited by the 1993 through 2000 data, a reasonable expected value would be about $43,000. This suggests a possible transposition in the published data.
4. The starting salary for the class graduated in May 2000 is based on the calculation of the actual starting salary as reported to the Placement Office. No official average will be available until approximately April 2001.

	1993	**1994**	**1995**	***1996*** *Note 2*	**1997**	**1998**	**1999**	**2000**
Auto & HE BS	25859	25761	31958	*31500*	33086	34833	38206	
Const. Mgt. BS	26601	28009	28633	*29500*	33667	34033	37136	
Electronics BS		25593	29319	*33500*	39500	36357	39318	
Facilities Mgt BS				*31500*		30833	31900	
Hvy Eq Service BS							33500	
HVACR BS	30273	31684	32345	*33500*	38115	37056	39500	
Manufacturing BS	31060	30203	34031	*33500*	45500	42833	38423	
Plastics BS	30915	32375	34988	*35500*	37367	41682	42093	
Printing Mgt. BS	18345		23746	*25500*	27382	28357	29500	
Product Design BS	26480	27069	31270	*29500*	33500	40167	**34731 note 3**	**47700 note 4**
Surveying E. BS	28605	26044	26971	*31500*	30167	34071	37735	
Welding BS	31200	34135	37068	*37500*	41233	44559	44500	
COT Average	**27704**	**28986**	**31033**	***32045***	**35952**	**36798**	**37212**	

Figure 7.1 Salary History

The class graduated in May 2000 was surveyed as to the number of job interviews obtained and the number of job offers extended. The following results were produced.

Number of graduating seniors reporting;	12
Average number of interviews;	3.7
Average number of job offers;	1.9

Please note that this survey was conducted in mid-April 2000. At this time several students had not yet accepted an employment offer and were continuing to interview. All but two Product Design students responding had at least one offer of employment.

E. SUMMARY

The Labor Market forecast data from both State of Michigan and the U.S. Government indicates very good to excellent projected growth in the demand for Product Design graduates through 2006 – 2008. This is a predictable statistic, since the high demand for consumer goods in the current expanding economy necessarily creates a demand for the designers of new products. Associated with the forcasted high demand is the "high" to "very high" salary levels indicated by state, federal and campus placement data. The most recent salary average obtained from May 2000 graduates is consistent with the published data for the "Mechanical Engineers" and "Designer" employment categories. In making this evaluation it is necessary to adjust the government's data for all salaries downward when comparing those salaries with the starting salaries of Product Design graduates without experience.

SECTION 8

FACILITIES AND EQUIPMENT

A. INTRODUCTION

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

The facilities of the Product Design Engineering Technology program are quite limited. Until 1994, most program activities were held room 301 of the Swan building. This was a rather large classroom (40 plus student capacity) with a small model shop area at the rear of the room. Because of a loss of manual drafting laboratory space due to the conversion of other Swan classroom space into computer labs and office space for computer support infrastructure, 301 was divided into two classrooms with drafting tables to support the displaced manual drafting activities. The Product Design model shop lab was eliminated. Since these changes made room 301 largely unuseable for most lecture activity, Product Design classes were moved to Swan 304, a large classroom which had been vacated by the elimination of the Technical Illustration program. The use of room 304, however, soon became problematic. Due to a shortage of classrooms capable of seating 40 students in the Swan building, room 304 soon became a critical general resource, largely used by large general classes for technology students and the Construction Department. This meant the frequent displacement of Product Design classes to other smaller Swan classrooms on a space available basis. During this period of time (1996-1998), the Product Design program did not have any room or facility assigned for its primary use. This, of course, led to a degree of discomfort among Product Design Students. They began to question the stability of the program, since it was the only program in the college of Technology having no assigned class space or area that could be identified as committed to the program.

In 1998 the Product Design program received a significant monetary gift from an outside benefactor. At the same time changes to the basic engineering graphics course (ETEC), eliminated some of the need for manual drafting classroom space. With the room 301 underutilized and with its own funding, the Design Program was able to obtain approval from the College of Technology to remove the drafting tables and refurbish one half of room 301. New carpeting, painting, tables and white boards were added at the expense of Local program funds. This room then became room 301A and has been the primary class area for the program since 1998.

B. FACILTIES RESOURCES

Currently, most Product Design courses (PDET prefix) having lecture content are taught in Swan 301A. This room has good lighting and, with its newer carpeting and tables, presents a stable, professional image to students. The room has an appealing display of all prior Product Design graduating classes and this has been a positive motivation for current Product Design students. The room has been maintained as a general purpose lecture classroom and this has led to an increasing use of room by non-PDET classes. If this trend continues (due to an overall shortage of lecture classroom space in the Swan Building) scheduling the room will become a problem. Product Design students have also expressed concern that the room they view as dedicated to the PDET program is a general purpose classroom with no computer integration. They expect a design program to be based in a facility that provides students with the opportunity for computer based instruction in a design studio format.

In addition to room 301A, the PDET program has exclusive use of a secure, small storage area immediately adjacent to the classroom. This space contains a single PC work station with printing, scanning and image processing capability for use primarily by senior students for their design projects. This is a stand alone station dedicated to PDET students and it is not part of the campus network. The area also provides secure storage for PDET files, reference material and for student project work in progress.

There are three Product Design Program specific courses which utilize laboratory resources. All other program unique laboratory content has been minimized or eliminated to fit available facility resources. Of special note in this regard is the absence of appropriate laboratory facilities for the Geometric Dimensioning and Tolerancing course (PDET 312). Current program laboratory use is limited to the following courses;

Course	Subject	Laboratory & Activity
PDET 322	Model & Prototyping	Uses Swan computer labs for 3D CAD assignments.
PDET 422	Advanced Machine Design w/ FEA	Uses Swan computer labs for ANSYS FEA assignments.
PDET 499	Senior Design Project	Uses Swan computer labs for preparation of the senior project and report.

C. LIBRARY RESOURCES

The Product Design program extensively uses Timme Library resources for several courses within the curriculum. Due to the nature of the design profession, much of the most important information is constantly changing in source and in content. This means that the primary Product Design student use of the library typically involves the periodical collections. The Product Design program faculty has been involved on an ongoing basis in selecting which periodicals are needed by the library to support the program. In addition to this service, the Product Design program also uses the library to place critical student reference material on reserve. Although there have been some recent problems in placing material on reserve in a timely manner, the library currently provides limited access archival support for all Product Design Senior Project reports from 1990 to present.

By far the most important library contribution to the program is the support of the student patent searches required as part of the Senior Design Project. Although most critical patent information has now been made directly available to students from the U.S. Patent Office via internet, the library continues to provide invaluable support in training Product Design students how to search the patent information database.

The trend towards increasing information availability via internet is of critical importance for Product Design students. One effect of this trend is that the use of on-shelf library resources has become less critical. With the launch of the FLITE, it will be the connectivity of the facility and its skilled technical personnel with knowledge of the U.S. Patent system that will make the greatest contribution to the Product Design program.

D. SUMMARY

The Product Design program facility resources consist of one closet, one shared use, general purpose classroom which serves as a program "home base" and various general use computer laboratories. These facilities currently in use by the Product Design program can be best described as minimally adequate. This has been achieved by modifying program content to fit the facilities available and by the expenditure of local program funds. Although significant facility improvements have been and continue to be made by the College of Technology for other program areas, there has been little expenditure by the college to improve or maintain facilities for the Product Design Program. Requests for Minor Capitalization expenditure and improvements recommended through Unit Action Plans have either been ignored or assigned a priority that effectively doomed the request. With a single faculty member and no administrative release time, the Product Design program has not been able to provide the level of visibility for its needs necessary to achieve a priority in funding proportional to its contribution to the University.

The lack of available facilities has limited program laboratory content and detracts from the program's image among current and prospective students

SECTION 9

CURRICULUM EVALUATION

A. INTRODUCTION

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

The Product Design Engineering Technology curriculum (see Appendix A), has remained essentially the same in terms of its required course content since the program's creation in 1988. Various changes were made during the conversion from quarters to semesters in 1993, however, no significant changes in content resulted from the conversion. A significant curriculum revision was made in 1994 as summarized below.

1. Created a new course (**PDET 413**) with both Fluid Power and Thermodynamics.
2. Revised an existing course to create a new course (**PDET 422**) in order to increase the machine design and Finite Element Analysis (FEA) content in the program.
3. Added a Technical Presentations course (**COMM 336**) to improve the presentation skills of program graduates.

Since 1994 there have been no curriculum changes made to the program. There have been several content changes made within existing program courses during the last few years. The most significant are as follows;

1. Converted the course PDET 322 from physical model making to a laboratory based 3D CAD solid modeling course.
2. Revised the Senior Design Project course (PDET 499) to more closely model a typical development project in industry.
3. Revised the Statistics and Ergonomics course (PDET 412) to reduce statistics content and increase ergonomic design content.

In order to determine if the current curriculum meets the needs of the market (i.e. the typical industrial employer) there were two evaluations made. The first evaluation was to analyze the collective input from graduates and employers. Although this alone would be adequate to meet the requirements of this program review, an additional evaluation was made to determine how well the current curriculum meets the engineering technology academic standards.

B. ANALYSIS OF CURRICULUM INPUT FROM EMPLOYER AND ALUMNI SURVEYS

The analysis of the recommendations made by Product Design alumni and employers is complicated by lack of a common employment target. The significant variation between products creates an equally large variation in the most critical skills needed to design those products. Further complicating the data is the variation in design methodology between different industries and different size employers. As can be observed from the results of the Employer follow-up survey (see Section 3) the collective input from the responding employers was that everything in the current program is very important but, in some cases, additional specific academic preparation was identified as needed. The recommendations, however, lack any apparent consistency between employers and since no academic areas were generally thought to be "not needed", there is no possibility of deleting an existing course to add a new one. The Alumni follow-up survey provides essentially the same result. Although program graduates shown a wider variation in response than employers, they do not as a group identify a common area to be added or deleted. An exception to

this is some of the University wide B.S. degree requirements (humanities, social science requirements, etc) which generally do not rate as high with graduates. These courses however are based on accreditation requirements and cannot be eliminated.

C. ANALYSIS OF ABET REQUIREMENTS

The standards established by the Accreditation Board for Engineering and Technology (ABET) are generally considered as the academic standard for engineering curriculum. Currently the Product Design Program is not ABET accredited. The question of whether ABET accreditation is a worthwhile activity has been debated extensively since the start of the program. To date there has been no consensus as to the desireability of pursuing this accreditation. Without attempting to resolve the issue within the scope of his program review, the ABET standards were used to evaluate the current program. The results of this review show that the current Product Design Engineering Technology program lacks only the addition of a second calculus course to meet the current ABET standards for Drafting/Design Engineering Technology (Mechanical) and similarly named programs. The addition of the second calculus course would require the elimination of at least one course in the current program.

D. SCHEDULING AND COORDINATION ISSUES

A continuing problem area concerning curriculum planning is the coordination of class schedules. There are two types of problems which impact the Product Design program. These are;

1. The lack of a managed standard for the times and days a course is offered. It is increasingly difficult to develop student schedules meeting program requirements when courses outside the program are offered at non-standard times. An aversion to Friday classes and the ability to modify class times to suit individual instructor preferences seems to be the cause of these problems. Examples are classes offered on MTW sequences, classes offered at different times on different days and the preponderance of university classes offered between 10 AM and 3 PM.

2. The lack of schedule coordination by supporting courses. There are many courses within the Product Design curriculum which are open for general university enrollment. These courses require careful integration into the program block schedule to ensure that all semester requirements can be met. A recurring and difficult problem results when a course needed for the Product Design block schedule changes its schedule without advance coordination. Such changes have become more common as the number of courses with restricted entry (i.e. "For PDET and PLTS") have been reduced. A schedule change in a required supporting course almost invariably forces multiple other changes in the schedules of other courses and the problem becomes severe if the change is not discovered until after all semester schedules have been established.

E. SUMMARY

The Product Design Engineering curriculum has been stable since its origination in 1988. The few changes made since that time been made to make targeted improvements in the quality of the design education without changing its scope or emphasis. The current program provides a quality well rounded program which is on target with the needs of industry as evidenced by survey results from students, graduates, employers and the Industrial Advisory Board. Several areas for improvement are indicated, however, and these will be discussed it Section 13.

SECTION 10

ENROLLMENT TRENDS

A. INTRODUCTION

The Product Design Engineering Technology program enrolled its first students in fall semester of 1988. A history of program enrollment relative to the College of Technology and the University for the last five years is shown in the following table.

On Campus Enrollment

	1995-96	1996-97	1997-98	1998-99	1999-00
PDET [1]	45	49	55	54	46
COT	2077	2238	2204	2234	2224
FSU	9767	9495	9468	9651	9668

Data taken from Fact Book 1999-00 published by the Ferris State University Office of Institutional Research

Notes; 1. Includes both PrePDET and PDET students

Off Campus Enrollment

	1995-96	1996-97	1997-98	1998-99	1999-00
PDET	18	18	40	26	30
COT	723	273	236	212	196

Data taken from Fact Book 1999-00 published by the Ferris State University Office of Institutional Research

B. ANALYSIS OF ON CAMPUS ENROLLMENT TRENDS

The available enrollment data indicates approximate stability for both the Product Design Program and the College of Technology over the last five years. University enrollment has rebounded slightly since its 1997-98 low of 9495 and seems to have stabilized at a level of about 9600 - 9700 students. Based on this data alone, the Product Design program would be expected to remain at about 50 students on campus.

The 50 students typical of the Product Design Program are divided approximately equally into the 3rd and 4th year classes. Of the 25 students found in a typical Product Design class, the following academic demographic exhibited by the class entering in Fall 2000 can be considered representative.

FSU CAD Drafting and Tool Design A.S. Graduates	6
FSU Mechanical Engineering Technology A.S. Graduates	12
Transfers from other colleges and universities (typically from CAD, Manufacturing or Mechanical Design AS programs.)	7
Total	25

During the first five years of the program, a typical 25 student class was primarily comprised of equal numbers of transfer students and FSU CAD Drafting graduates. It is important to note that this indicates that there has been a shift toward enrolling more FSU students (especially Mechanical Engineering Technology - MET) students and a shift away from A.S. degree transfers from other community colleges. This may indicate that current recruitment and marketing efforts for transfer students is inadequate. With respect to the on campus enrollees, it is a concern that recently approved BS MET program will probably eliminate many potential BS PDET students. The reduction in enrollment from the CAD Drafting program is also of concern. In this case the reduction in qualified applicants seems to be because of;

1. Students from the CAD Drafting program enrolling in Technical Education.
2. More CAD Drafting students enrolling to the BS Manufacturing Engineering Technology and Plastics programs.
3. Students electing to begin work immediately after the A.S. degree.

Although it may be possible to increase CAD Drafting student enrollment by better recruiting efforts on part of the Product Design Program, the overall outlook for enrollment from FSU A.S. programs is poor. In order to sustain or increase the current 25 student typical enrollment, increasing numbers of qualified, transfer students from the various regional Community Colleges must be located and encouraged to enter the program. This will require a new recruiting initiative.

C. ANALYSIS OF OFF CAMPUS ENROLLMENT TRENDS

The available enrollment figures show that there has been a steady enrollment in Product Design at the Applied Technology Center (ATC) even though the overall enrollment in College of Technology programs at the Center has been in a steady decline. Currently about 30% of the total College of Technology enrollment at the ATC is from the Product Design program. Although there are no current indications that threaten this level of enrollment, it is believed that improved marketing efforts could provide a substantial increase in ATC enrollment. Currently, most off campus Product Design students have been referred to the program by someone who has direct experience with the program. There are also an increasing number of Ferris State A.S. graduates who are taking the Product Design Program at night while working in the excellent West

Michigan job market. There are no indications that the ATC Product Design enrollment is the result of various media advertising efforts.

It is believed that there are substantial numbers of qualified potential Product Design students currently working in the greater Grand Rapids area who are simply not aware of the program. With better exposure and an effort to make the program more convenient it should be possible to achieve a significant increase in off campus enrollment.

SECTION 11

PROGRAM PRODUCTIVITY

A. INTRODUCTION

There are two primary measures of efficiency and financial performance used at Ferris State to evaluate academic programs. Program Productivity is a measure of faculty output and Degree Program Costs measures the cost of a credit hour from a specific program. The data presented in this section includes information from the last five years where available from the Product Design Program, the College of Technology and Ferris State University for comparison and trend analysis. Although the Product Design program compares quite favorably with other College of Technology programs (especially B.S. programs) this has not been included because the variation in program organization and purpose makes accurate program to program comparisons inherently inaccurate.

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 in courses with a specific identifying prefix. Product Design Engineering Technology courses are identified by a PDET prefix. A high SCH/FTEF ratio meaning many credit hours produced (sold) per faculty resource invested is desireable. Courses used to meet general university requirements and taught in a mass lecture format generally have the best SCH/FTEF ratios.

The Program Productivity information presented here is from the Fall 1995 – Winter 2000 Productivity Report published by the Ferris State University Office of Institutional Research.

CREDIT HOURS & FACULTY

Academic Year	**5/96**	**96/97**	**97/98**	**98/99**	**99/00**
Student Credit Hours (SCH) For PDET prefix courses	582	556	549	618	527
Full Time Equiv. Faculty (FTEF) For PDET prefix courses	1.35	1.93	1.03	1.41	1.33

Notes; 1. SCH and FTEF information is the average of Fall and Winter semesters and includes no summer information.
2. Since 1995 there has been only one assigned Product Design faculty member. Additional faculty resources utilized are from adjunct instructors and faculty assigned from other programs.

The SCH generated by PDET prefix courses has been relatively consistent with respect to its five year average of 566 SCH per year. The FTEF utilized by PDET prefix courses has shown a much larger variation and is at least partially the result of the allocation for the PDET faculty member who served as full time Acting Dean for the College of Technology during the 1996 – 1998 period.

SCH/FTEF RATIO

Academic Year	95/96	96/97	97/98	98/99	99/00	Five Year AVG
For PDET Prefix courses	432	288	535	439	396	418
For College of Technology	335	333	323	330	332	331
For Ferris State	464	447	442	457	455	453

The SCH/FTEF ratio for the Product Design Program is slightly below the Ferris State average value and well above the College of Technology average for all years except 96/97. The non representative results for these years were created by the allocation of FTEF for the 96/97 and 97/98 years as discussed previously.

B. PROGRAM COSTS

The measure of Degree Program Cost per program credit hour is used to measure the AVERAGE **COST** of a credit hour generated by the program. Since each student paid $172 in tuition for each credit hour during the 1998-99 school year, a low Average Cost per credit hour means more revenue for the university. Note that this is an average cost and that it includes credit hours of which the program has a degree of control (courses with the PDET prefix) as well as courses from other departments and colleges of the university. It also should be noted that this cost includes departmental and college overhead allocations.

The Program Cost information presented here is from the 1998 – 1999 Degree Program Costs published by the Ferris State University Office of Institutional Research.

DEGREE PROGRAM COSTS PER STUDENT CREDIT HOUR 1998 - 1999

Product Design Degree Program Cost Average ($/SCH)		$191.17
College of Technology Degree Program Cost Average ($/SCH)		$214.03
Ferris State Degree Program Cost Average ($/SCH)		$182.90
Ferris State Degree Program Cost Highest ($/SCH)	$561.00	
Ferris State Degree Program Cost Lowest ($/SCH)	$109.89	

The degree program costs for the Product Design Program are slightly above the Ferris State University average and below the College of Technology average.

C. OTHER FACTORS

The Product Design Engineering Technology program provides a significant contribution to Ferris State University and the College of Technology in a manner not directly reflected in the Productivity and Cost measurements. The current Product Design program requires four 17 hour semesters or a total of 68 semester hours for the degree. A breakdown of these hours is as follows;

Semester Hours - PDET prefix courses	23
Semester Hours - other College of Tech. Prefix courses	20
Semester Hours – other Ferris State courses	25
TOTAL	68

This breakdown clearly shows that each Product Design student will provide a semester hour contribution to other programs within the College of Technology and to the University roughly equivalent to the semester hours taken in PDET prefix courses. Since these courses, required by the program, are often part of the general requirements for many programs, the Product Design program helps to increase productivity of other areas of Ferris State University. The presence of high productivity general courses, in turn, helps reduce the cost of the degree programs offered by other departments. Since no PDET prefix courses are required or even allowed by other degree programs, the Product Design program does receive this benefit.

SECTION 12

CONCLUSIONS

THE PDET PROGRAM GOALS AND OBJECTIVES ARE CENTRAL TO THE FSU MISSION

The PDET Program provides applied technical education central to the Ferris State University mission. The graduates of this program are provided career skills in mechanical design which are in demand in the industrial workplace and which provide productive, well paying careers.

THE PDET PROGRAM IS UNIQUE AND IS WELL POSITIONED TO INCREASE ITS VISIBILITY

The only other known program offering a technical education leading to a Bachelors degree in Product Design is the Product Design program within the Engineering College of Stanford University. With a large number of established and successful program graduates, the opportunity exists to increase PDET program visibility on a state and national level. In addition the program has the opportunity to develop unique new programs combining technology and art by developing such programs in cooperation with the Kendall College Industrial Design program.

THE PDET PROGRAM PROVIDES IMPORTANT SERVICES TO THE STATE AND THE NATION

The PDET program produces graduates which provide important and useful services on both a state and national level. Projections from both state and national agencies show the employment categories applicable to Product Design graduates with good to excellent growth potential in both numbers of positions and in salary level.

THE PDET PROGRAM IS IN DEMAND BY STUDENTS

PDET program enrollment has remained steady in the number of on-campus students and has increased in the number of off-campus students enrolled. Indications are present that suggest that a significant increase in the number of qualified and interested students could be achieved by more effective promotion of the program coupled with minor investments in facilities.

THE PDET PROGRAM QUALITY OF INSTRUCTION IS EXCELLENT

PDET students and graduates are very satisfied with the quality of education provided by the program. The excellent career development as indicated by position and/or salary survey information indicates that students are well prepared to enter the workplace. Students and graduates both indicate that the quality of instruction provided by the program is well above that provided by other areas of the university.

THE PDET PROGRAM GRADUATES ARE IN DEMAND

Graduates of the PDET program indicate that they have little difficulty in obtaining employment after graduation. Starting salaries excellent. PDET graduates typically have starting salaries at or above those of other programs in the College of Technology and well above those of other Bachelors level programs at the university. Most graduates in the class of May 2000 had multiple job offers well before graduation.

THE PDET PROGRAM FACILITIES AND EQUIPMENT ARE MARGINAL

There has been no significant investment in facilities for the Product Design program made by the College of Technology or the University at any point during its ten year history. The only facility improvement benefiting the program was the remodeling of the 301A classroom in 1999 and this was completed using local program funds. The current primary classroom for the program lacks the computer integration necessary to improve the content and appeal of the program.

THE PDET PROGRAM HAS ADEQUATE LIBRARY INFORMATION RESOURCES

The PDET Program receives critical support from the Timme Library staff in training students to search the patent database. The program also receives assistance in reserving class material and in archiving completed student project reports. The need to improve the number and selection of Product Design periodicals is being addressed.

THE PDET PROGRAM COST IS ACCEPTABLE

The productivity of the PDET program faculty as measured by the SCH/FTEF ratio is well above the average for the College of Technology and slightly below the average for FSU. The Degree Program Cost per student credit hour are below the College of Technology and slightly above the average for FSU. In addition each PDET student provides a credit hour contribution to both the college and the university equal to the credit hours taken in program courses. The annual expense budget for the program is less than half that of the next lowest program in the college.

THE PDET PROGRAM HAS NOT RECEIVED ADEQUATE ADMINISTRATIVE SUPPORT

For the last five years the PDET program has consisted of a single faculty member supported by various adjunct and faculty overload assistance from other programs. While these have met the immediate need to provide classroom instruction, there has been no support provided for advising approximately 80 students each semester, processing prospective student applicants or for any of the many other administrative requirements necessary for the program. Effective recruitment and promotion for the program has been at a standstill. There has been little administrative support in hiring a replacement faculty member and none of the salary savings realized during this period of understaffing have been used to develop the program.

It is hoped that, with the hiring of a second faculty member for the program starting in the Fall 2000 semester, these problems will be eliminated and the Product Design Engineering Technology program will have the necessary faculty resources to improve rather than simply sustain.

SECTION 13

RECOMMENDATIONS

The Program Review Panel has carefully evaluated the results of this program self study. The average scores based on the individual evaluations of the four panel members are presented in Appendix G. The results of the evaluation averages indicate that the following areas are the strongest aspects of the program. These areas were all rated 5 on a range of 1 to 5 with 5 being the best possible.

Student Perception of Instruction
Student Satisfaction with Program
Advisory Committee Perceptions of Program
Demand for Graduates
Use of Information on Labor Market
Use of Student Follow-up Information

The weakest areas of the program were indicated as follows (shown with average score).

Facilities (2.5)
Equipment (1.75)

Based on the overall evaluation of the Product Design Engineering Technology program by the Program Review Panel, the following recommendations are made to maintain or enhance the Product Design Engineering Technology program strengths and to reduce its weaknesses.

1. The PDET program should immediately incorporate instruction in a parametric design software package such as PRO-ENGINEER. This incorporation is supported by the Employer Survey results (see Section 3). This will greatly enhance the marketability of program graduates and provide the opportunity to increase the quality of student portfolios. PRO-ENGINEER is specifically recommended because it has a large industrial base, will operate well in a PC environment and offers a full featured student software version at a reasonable cost (approximately $300). To support this implementation an expenditure in faculty training will be necessary.

2. To minimize the costs of each program, the PDET program should seriously evaluate opportunities for course sharing with the new Mechanical Engineering B.S. program. This will be required to reduce the impact of any reduction in enrollment in PDET due to the new BSMET program.

3. The PDET program should develop a new course in conjunction with the ART department to provide Product Design students with more advanced sketching and product rendering skills than those currently provided by ARTS 101. This new course would eliminate a weakness in the program as perceived by students and graduates while better developing the hand sketching skills identified as important by employers. This course should be open to general enrollment in order to maintain suitable productivity.

4. The most important facility related need for the Product Design Program, is the development of a secure, computer integrated classroom area dedicated to Product Design activity. The design and development of new products has become a progressively more computerized activity. For new designers and engineers simple exposure to design tools and basic computer familiarity is no longer adequate. Design students must achieve a higher level of computer competency with real

world tools and, in order to do this, more computer based lab activity must be integrated into the program. This will require lab and lecture content to be more flexible. Lectures are not effective in the typical computer lab and computer resources are usually not available in most lecture rooms. Dedicating rooms to each function is not efficient and does not allow flexible class content. A learning environment that can efficiently support either function dynamically is needed.

The Computer Integrated Classroom (CIC) needed to support this concept will be significantly different than the existing computer labs of the Swan building. A CIC will provide each design student with an assigned workstation. This workstation will provide a AC power outlet and a storage area for student owned laptop equipment. The station will also provide a local network connection for access to share resources such as printers, plotters and scanners as well as providing for easy file exchange between students. To minimize support requirements, the CIC network should be entirely local to the classroom with no file server or central storage provided. Student Designers will attend class in the CIC with their laptop PC. The class may begin as a conventional lecture with all PCs placed in a storage area at each assigned workstation. At the appropriate point in the class, each student would move their PC from its storage area to the surface of the workstation and complete a computer based portion of the class. Each student would work from their own copy of student edition software (a required purchase for the class) and would be responsible for storing and maintaining their own files on their own hardware. When the class is finished, the student would be able to secure and leave their equipment and work in the storage area of the workstation in the secure classroom.

To develop the Computer Integrated Classroom for Product Design, the College of Technology would be required to make a facilities investment in obtaining and wiring the new student workstations in Swan 301A. Printing and scanning resources have already been purchased by local funds. Savings in the purchase of hardware and software upgrades would offset the cost of this investment and should allow a reduction in computer support personnel. A significant increase in perceived value and innovation by current and prospective students will result from making this transition.

5. The PDET program should seek ABET accreditation. This change is highly supported by program graduates. Although this issue is of questionable real value to employers, a preliminary analysis indicates that the impact of accreditation to the program curriculum would be minor. If this proves correct, the change could be made without impacting the areas of the program perceived as most valuable by all surveyed groups. The initial cost and the periodic maintenance costs of accreditation should be justified by increased program recognition and the elimination of a competitive issue with respect to degree programs at other universities. It is recommended that assistance from outside the PDET program be used to direct the accreditation activities.

6. The PDET program should develop a dual BS-BFA degree program with the Industrial Design department of Kendall College. It is likely that such a degree could be offered without adding staff or new courses and it would be a nationally unique offering. This effort should be included with the launching of the Dow Center of Art, Design and Technology, the $2 million effort at Kendall with the stated objective of merging technology with visual arts/design.

7. The PDET program should be more effectively promoted in the Grand Rapids market by developing elective based variations of the program uniquely designed in cooperation with major employers such as Rapistan and Steelcase. This coordination would be conducted with the management of selected area companies identified as being likely to have a significant number of designers meeting PDET program entrance requirements. The result of this effort would be better support and sponsorship of the PDET program from those employers. This in turn should make the PDET program more available to its target market and increase off campus enrollment. This activity will require an investment in program faculty time and travel expense.

8. The PDET program should be more effectively promoted among Michigan community colleges. It is proposed that the current framework of articulation agreements be thoroughly reviewed for accuracy and completeness. This review should be conducted directly on site at the community college and should involve direct discussion between PDET program faculty and the faculty of those programs which are likely to produce qualified PDET applicants (feeder programs). Once this initial step has been completed, there should be a scheduled annual contact between the PDET program faculty and the community college contact. This activity will require an investment in program faculty time and travel expense.

9. Although it is an item not under the control of the PDET program, it is recommended that university administration improve the level of standardization in class times across the university in order to increase efficiency in curriculum scheduling. In addition it is also recommended that the university develop a control mechanism to ensure that non-program courses are adequate to meet program block schedule requirements and that these courses are not allowed to make schedule changes without advance notification to the programs which they support.

10. It is recommended that the PDET program develop a practical test instrument to assess the level of knowledge of incoming students and the knowledge of students who have completed the program. Since there is no current standardized test applicable to the unique content of the PDET program, this test will have to be developed and test implemented by the PDET program faculty. This activity will require an investment in program faculty time.

APPENDIX A

Supporting information for Section 1 – Overview

Curriculum Guide Sheet – Product Design Engineering Technology

CURRICULUM REQUIREMENTS
PRODUCT DESIGN ENGINEERING TECHNOLOGY
BACHELOR OF SCIENCE DEGREE
FALL SEMESTER

ENTRY CRITERIA:

1. Associate Degree in Ferris Mechanical Engineering Technology, Technical Drafting and Tool Design, Pre-Engineering or similar approved programs from various transfer institutions.
2. 2.75 honor point average in major coursework.
3. 2.50 honor point average in mathematics coursework.
4. Have taken Math through Algebra & Analytic Trigonometry; example MATH 126 at Ferris.
5. Have taken a basic speech course; example COMM 105 or COMM 121 at Ferris.
6. Have completed 6 semester hours of college English; example ENGL 150 & 250 at Ferris.
7. Have completed 3 semester hours in an approved Social Awareness subject area other than Psychology; example areas include Anthropology, Economics, Geography, Political Science, Sociology or Social Science.
8. Have completed 4 semester hours of Science; example areas include Biology, Geology, Chemistry or Physics.
9. Have completed 3 semester hours in an approved Cultural Enrichment subject area; example areas include Language, Literature and Theater.

SPECIAL CONDITIONS:

A. *These courses, if completed as part of an Associate Degree program in Mechanical Engineering Technology or similar programs, must be replaced with pre-approved courses from areas with the following prefixes:

BUSN	CADD	ISYS
CPSC	MGMT	EEET (320 or higher)
MFGE	SPAN	GERM

B. Any required course listed on the Curriculum Guide Sheet which has been completed before entry into the PDET program must be replaced with approved electives.

C. Applicants who fail to meet criteria numbers 4-9 may be admitted to the program; however, courses may need to be taken during the summer between the Junior and Senior year to progress through the program in a timely manner.

D. MATL 240 - Introduction to Material Sciences is a prerequisite for MATL 341 - Material Selection Metals.

NOTE: Ferris State University requires all Bachelor Degree programs to meet specific General Education requirements. The PDET program meets these requirements by the following:

Cultural Enrichment Credits = 9 hrs; 3 hrs must be provided by AAS degree coursework (see criteria #9).
Communication Credits = 12 hrs; 9 hrs must be provided by AAS degree coursework (see criteria #5 & 6).
Social Awareness Credits = 9 hrs; 3 hrs must be provided by AAS degree coursework (see criteria #7).
Scientific Understanding = 7-8 hrs; 4 hrs must be provided by AAS degree coursework (see criteria #8).

Credits not taken during the AAS degree must be made up (see Special Conditions "C").

(OVER)

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

PRODUCT DESIGN ENGINEERING TECHNOLOGY
BACHELOR OF SCIENCE DEGREE
FALL SEMESTER
Curriculum Guide Sheet

NAME OF STUDENT _____ STUDENT I.D. _____

Total semester hours required for graduation: 68

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

			CREDITS	COMMENTS/GRADE
THIRD YEAR - FALL SEMESTER				
PDET	311	Seminar in Product Design	1	
PDET	312	Advanced Tolerancing	2	
EEET	318	Electrical Technology for Product Design & Rubber*	4	
MECH	240	Statics and Strengths of Materials*	4	
ARTS	101	Basic Art (Cultural Enrichment)	3	
CHEM	103	Chemistry (Scientific Understanding)	3	
THIRD YEAR - WINTER SEMESTER				
PDET	321	Applied Mechanics and Kinematics*	3	
PDET	322	Model and Prototype	2	
MFGE	352	Design for Manuf.	2	
PLTS	342	Material Selection Plastics	3	
MATH	216	Applied Calculus (Quantitative Skill)	4	
PSYC	150	Introduction to Psychology (Social Awareness)	3	
FOURTH YEAR - FALL SEMESTER				
PDET	411	Machine Design*	3	
PDET	412	Statistics/Ergonomics	2	
PDET	413	Applied Fluids and Thermodynamics#	3	
MATL	341	Material Selection Metals (MATL 240)	3	
PSYC	326	Industrial-Organizational Psychology (This is the 300 Level Social Awareness)	3	
____	___	Global Consciousness Elective (To be taken in the Cultural Enrichment Subject Area). See University Catalog for approved courses	3	
FOURTH YEAR - WINTER SEMESTER				
PDET	499	Product Design Project (Capstone Assessment)	3	
PDET	422	Advanced Machine Design with FEA	4	
HSET	403	Testing Systems and Analysis	4	
ENGL	321	Advanced Composition (Communication Competence)	3	
COMM	336	Technical and Professional Presentation (Communication Competence)	3	

(OVER)

APPENDIX B

Supporting information for Section 2 – Graduate Survey

Example Cover Letter – Graduate Survey

Graduate Survey Instrument

FERRIS STATE UNIVERSITY

June 22, 2000

Steven Williamson
9426 Ray Avenue
Grayling, MI 49738

Dear Steven,

I hope that your professional career has been going well since you earned your Product Design degree at Ferris State. If you are like most graduates, you probably have more work than time available. I am writing you, however, to request your help in an important activity that will directly impact the future of the program.

All degree programs at Ferris State University are required to be reviewed periodically in accordance with the requirements defined by the North Central Association for Accreditation. An important part of this review is the evaluation of the program by its graduates. In order to provided an organized means for all PDET graduates to give meaningful input into this review, you are being asked to complete the enclosed survey. The survey is intended to evaluate various aspects of the Product Design Engineering Technology program. Of primary importance is the evaluation of the following areas:

1. How well did the PDET program prepare you to enter the engineering profession?
2. What are the most valuable subject areas of the PDET program?
3. What are the least valuable subject areas of the PDET program?
4. What modifications should the program make to better prepare future graduates?

Your participation is critical for a complete and accurate evaluation of the Product Design Engineering Technology program here at Ferris State University. Your responses will be used to modify and improve the PDET program so that each future graduating class will continue to meet the ever-changing requirements of the profession.

To complete the analysis of your collective input, I would like to have your response returned to me not later than July 19, 2000. If you have questions or need more information to complete the survey, please feel free to call me at (231) 591-2635 or e-mail me at goosenr@ferris.edu.

Thank you,

Richard F. Goosen, PE
Assistant Professor
Product Design Engineering Technology

DESIGN & MANUFACTURING
COLLEGE OF TECHNOLOGY
915 Campus Drive, SWN 109, Big Rapids, MI 49307-2291
Phone 616 592-2511 Fax 616 592-2407

Product Design Engineering Technology Program Survey

About Yourself

Note that this information will be collected and used by the Product Design Program without identifying you personally. Your identity will be considered confidential and not released outside of the Product Design Program.

1. Name (Note; You can ignore questions 1-4 if you attach a current business card);

2. Company you currently work for;

3. Title;

4. City and zip code where you work;

5. What year did you graduate from the Design program?

6. What was your Associates Degree area of study and where did you earn it?

7. Did you take most of your courses (circle) ON CAMPUS or OFF CAMPUS

8. Have you completed any college coursework since leaving FSU? If so, what was your area of study / program and which college or university did you attend.

9. What was your starting annual salary in dollars after your graduation (optional - please circle one)

15 – 20,000 21 - 25,000 26 – 30,000 31 – 35,000 36 – 40,000 41 – 45,000

46-50,000 51-55,000 more than 55,000

10. What is your current annual salary in dollars (optional - please circle one)

15 – 20,000 21 - 25,000 26 – 30,000 31 – 35,000 36 – 40,000 41 – 45,000

46-50,000 51-55,000 56-60,000 61-65,000 66-70,000 71-80,000

81-90,000 Greater than 90,000

11. Circle the category (or more than one) that best describes your current position;

Design Technical Management (of an engineering dept. or section)

Sales/Marketing General Management (of a facility, company, division, etc)

Project/Product Management Other _____

About Your Product Design Education

12. In your opinion, based on your experiences since graduation, to what extent did the specific subject areas of the Product Design academic program prepare you for employment. Indicate your opinion next to the subject area according to the following scale;

5 – Very Important
4 - Somewhat important
3 - Neutral or I did not take this subject
2 - Of marginal value
1 - Of no value

____Advanced GD&T	____Plastics Material Selection	____Advanced Composition
____Statics and Strengths of Matls	____Applied Calculus	____Technical Presentations
____Chemistry	____Machine Design	____Finite Element Analysis
____Art	____Psychology	____Testing Systems
____Dynamics	____Thermodynamics	____Senior Design Project
____Model & Prototyping	____Metals Materials Selection	

Your Opinions on Miscellaneous Topics

13. In your opinion what was the most valuable aspect of the PDET program. This may be a course (or courses) or a general aspect of the program (such as "applied problem solving").

14. In your opinion what was the least valuable aspect of the PDET program.

15. Did you have a difficult time finding your first job after graduation (circle the level of difficulty) ?

    1 No Difficulty 2 3 4 5 Very Difficult

16. Overall are you satisfied with the PDET education you received at FSU ? (circle)

    1 Very Satisfied 2 3 4 5 Completely Unsatisfied

17. Many engineering programs are now accredited by a national engineering organization (ABET). The current PDET program is not ABET accredited. To become accredited under ABET rules the program would be required to add a second Calculus course. This would require the elimination of some aspect of the current program of study. In your opinion (check your selection);

    ____ABET accreditation is a good idea. To add another calculus course, the program should eliminate;

    ____ABET accreditation is not a good idea or worth changing the program to achieve.

18. Based on your experience, what professional organization would you recommend for PDET students to join before graduation (Note; currently many PDET students become SAE members).

_____None I recommend _____

19. In your opinion how important to a product designer is the ability to create renderings and sketches of products by free hand drawing?

____ Not important at all
____ Product rendering ability is useful but there is no need to create these drawings free hand
____ Useful but not critical
____ Very Important

20. In the space below please identify any changes or additions would you recommend for the PDET program and /or provide any general comments that you would like to have evaluated.

Please return this survey using the addressed, stamped envelope provided. Try to return your response by July 19, 2000.

Thank you for your help in evaluating the Product Design Program.

APPENDIX C

Supporting information for Section 3 – Employer Survey

Employer Mailing List

Example Cover Letter – Employer Survey

Employer Survey Instrument

EMPLOYER MAILING LIST	APR - PRODUCT DESIGN			
Herman Miller Inc.	ATTN: Ruthanne Pierson	18558 171st Ave	Spring Lake, MI	49456-0530
AAR Cadillac Manufacturing Inc	ATTN: Dan Breunsbach	201 Haynes Street, PO Box 550	Cadillac, MI	49601
Wedin International Inc.	ATTN: Jason Crosby	1111 Sixth Ave	Cadillac, MI	49601
Parker Hannifin Corp.	ATTN: Tami Selesky	8790 W. Tamarack Rd.	Lakeview, MI	48850
Nucraft Furniture Co.	ATTN: Scott Carpenter	5151 W. River Drive	Comstock Park, MI	49321
Rapistan Demag	ATTN: Bob Glover	507 Plymouth Ave. SE	Grand Rapids, MI	49505-6098
Rapistan Demag	ATTN: Mike Jones	507 Plymouth Ave. SE	Grand Rapids, MI	49506-6098
Broadview Product Development	ATTN: Phil Carpenter	110 W. Washington	Zeeland, MI	49464
Johnson Controls Inc.	ATTN: Dave Spykerman	915 E. 32nd Street	Holland, MI	49423
Valley Gear & Machine Inc.	ATTN: Richard Booms	514 Chickory Street	Bad Axe, MI	48413
Thermotron Industries	ATTN: Clint Peterson	291 Kollen Park Dr.	Holland, MI	49423
Gerber Products Co.	ATTN: Bill Hudson	445 State Street	Fremont, MI	49413
Gerber Products Co.	ATTN: Brenda Meyers	728 Booster Blvd	Reedsburg, WI	53959
Clarion Technologies Inc.	ATTN: Adam Luedke	6719 Pine Ridge	Jenison, MI	49428
Renee Scott	**ATTN: John Geddi - GM**	**29881 Quinkert St.**	**Roseville, MI**	**48066**
Mid-American Products Inc.	ATTN: Todd Tippen	P.O. Box 983	Jackson, MI	49204
SJE - Rhombus	ATTN: Rory Lee	P.O. Box 1708	Detroit Lakes. MN	56502-1708
Tecumseh Products Co.	ATTN: Cristina Meorimeoto	100 E. Batterson St.	Tecumseh, MI	49286

Four Winns	ATTN: Kelli Cater	925 Frisbie St.	Cadillac, MI	49601
Delphi Automotive Systems	ATTN: David Rowe	Timberland Office Park 1450 West Long Lake	Troy, MI	48098
Donnelly Corp.	ATTN: Grant Gehrig	49 W. 3rd Street	Holland, MI	49423-2813
Dura Automotive	ATTN: Claudia Davidson	P.O. Box 467	Fremont, MI	49412-0487
US Filter / JWI	ATTN: Rich Allred	2155 112th Ave	Holland, MI	49424
Creative Technologies, Inc.	ATTN: Dave Mathews	2441 N. Opdyke Rd.	Auburn Hills, MI	48326-2442
Harsco Track Technologies	ATTN: Karen McDonald	200 S. Jackson Rd.	Ludington, MI	49431
American Seating	ATTN: Kieth McDowell, V.P. Eng.	401 American Seating Center	Grand Rapids, MI	49504
Gentex	ATTN: Kurt Wassink	600 N. Centennial St.	Zeeland, MI	49464
LA-Z-BOY	ATTN: Kelly Stump	1284 N. Telegraph Rd.	Monroe, MI	48162
Steelcase	ATTN: Wendy Horner	P.O. 1956	Grand Rapids, MI	49501
ENTELA	ATTN: Greg Marshall	3033 Madison SE	Grand Rapids, MI	49548
Fisher Price	ATTN: Ted Skelton, Director HR	636 Girard Ave.	East Aurora, NY	14052
Lacks Industries	ATTN: Roger Andrzejewski	P.O. Box 888	Grand Rapids, MI	49588
Whirpool Corp.	ATTN: Mark Mejeur	303 Upton Drive	St. Joseph, MI	49085
Smiths Industries	ATTN: Don Eenigenburg - Engineering	3290 Patterson SE	Grand Rapids, MI	49512-1991
Smiths Industries	ATTN: Don Eenigenburg - Manufacturing	3290 Patterson SE	Grand Rapids, MI	49512-1991
Gast Manufacturing Corp.	**Michelle Metz**	**P.O. Box 97**	**Benton Harbor, MI**	**49023**

Hadley Products	Bob Sorum	2851 Prairie St.	Grandville, MI	49418
AMFAB Inc.	Bruce Lowstuter	2525 Miller Rd.	Kalamazoo, MI	49001
Humphrey Inc.	Qianna Rumph	P.O. Box 2008	Kalamazoo, MI	49003
Stryker Medical	Michelle Smith	6300 Sprinkle Rd.	Kalamazoo, MI	49001
Borroughs Corp.	Jeff Abrams	3002 N. Burdick St.	Kalamazoo. MI	49004
Holland Hitch Co.	Greg Thorwall	P.O. Box 2099	Holland, MI	49422
MasterTag	Becky Bush	9350 Walsh Rd.	Montaque, MI	49437
Brunswick Indoor Recreation	David Apple	525 W. Laketon Ave.	Muskegon, MI	49441
Peer Welding Systems	Matt Bechtel	2100 E. Empire Ave.	Benton Harbor, MI	49022
Track Corporation	Fred Jacobs	1810 Industrial Park Drive Suite D	Grand Haven, MI	49417
Alma Products Co.	Jack Ulrich	2000 Michigan Ave.	Alma, MI	48801
RDS Inc.	Randy Dyke	14200 Ironwood Dr. NW	Grand Rapids, MI	49544
Bradford Company	Human Resources	13500 Quincy St.	Holland, MI	49422
Flexfab Horizons Intl., Inc.	Steve Egleston	1699 W. M43 Highway	Hastings, MI	49058

FERRIS STATE UNIVERSITY

July 19, 2000

Thermotron Industries
ATTN: Clint Peterson
291 Kollen Park Dr.
Holland, MI 49423

Dear Clint,

I am writing you in order to obtain your help in evaluating the Product Design Engineering Technology academic program at Ferris State University. This survey is being sent to many West Michigan companies selected at random from those companies who were likely to employ mechanical designers. Your company may or may not have hired Ferris Product Design graduates in the past and your company may not be familiar with the specifics of the academic program as it exists here at Ferris. Since we are interested in evaluating the needs of all companies involved in mechanical design, however, any input that you can provide will be valuable in determining the future direction of this program. It is also possible that you may feel that someone other than yourself would be in a better position to complete this evaluation. If so, please feel free to forward the survey to the best available authority.

The purpose in completing this survey is two-fold. All degree programs at Ferris State University are required to be reviewed periodically in accordance with the requirements defined by the North Central Association for accreditation. An important part of this review is the evaluation of the program by its customers (the industrial employers). Secondly, and more importantly from your viewpoint, is the need to review the needs of industry in order to provide a dependable source of new graduates who are suitably trained in the most critical areas of design. Of primary importance is the evaluation of the following areas;

1. How well does the Product Design program provide the appropriate technical training needed for mechanical design at your company?.
2. What are the most valuable subject areas of the current Product Design program?
3. What are the least valuable subject areas of the current Product Design program?
4. What modifications should the program make to better prepare future graduates?

If you have no knowledge of the Product Design Engineering program at Ferris State, I have included a short overview of the program on the back of this letter. You may use this description as the basis of your evaluation.

Your participation is critical for a complete and accurate evaluation of the Product Design program here at Ferris State University. Your responses will be used to modify and improve the Product Design program so that future graduates will continue to meet the ever changing requirements of the profession.

To complete the analysis of your collective input, I would like to have your response returned to me not later than August 4, 2000. If you have questions or need more information to complete the survey, please feel free to call me at (231) 591-2635 or E-mail me at GOOSENR@FERRIS. EDU.

Thank you,

Richard F. Goosen PE
Assistant Professor PDET

DESIGN & MANUFACTURING
COLLEGE OF TECHNOLOGY
915 Campus Drive, SWN 109, Big Rapids, MI 49307-2291
Phone 616 592-2511 Fax 616 592-2407

PRODUCT DESIGN ENGINEERING TECHNOLOGY - PROGRAM SUMMARY

The Product Design Engineering Technology program at Ferris State University graduated its first class in May 1990. Typically the program provides 25 – 30 graduates each year for primarily Western Michigan employers. Most students attend class full time on campus in Big Rapids, however there are a number of working students who complete the same academic program at night in Grand Rapids. The Product Design program leads to a Bachelor's of Science degree and can be completed in two years of full time study. To be admitted into this program, all students must have completed at least an Associates Degree at Ferris State or some other accredited college or university in a technical area of study with approximately 60 transferrable semester credit hours. Typically most students start the Product Design program in their junior year after completing an Associates degree in Computer Aided Drafting, Pre-engineering, Mechanical Engineering Technology or Manufacturing Engineering Technology.

The primary focus of the Product Design program at Ferris State University is applied mechanical engineering with a CAD emphasis. All technical courses are application focused with minimum theoretical content. In these classes, most class time is spent on solving actual design problems. Derivation of design equations and practices is only provided to the level necessary to understand critical concepts. Product Design students are required to use several software applications in their coursework, most notably ANSYS for Finite Element Analysis, AUTOCAD for conventional drawings and PRO-ENGINEER for parametric modelling and 3D design.

Product Design Engineering Academic Program;

1st Semester	2nd Semester
Seminar in design principles	Applied Engineering Dynamics
Geometric Dimensioning & Tol.	CAD Solid Modeling (PRO-E)
Basic Electronics	Design for Manufacturing
Statics & Strengths of Materials	Material Selection – Plastics
Basic Art (artistic rendering)	Applied Calculus
Basic Chemistry	Introduction to Psychology

3rd Semester	4th Semester
Machine Design	Senior Design Project *
Statistics & Ergonomics	Advanced Machine Design with FEA (ANSYS)
Applied Fluids & Thermodynamics	Testing Systems & Analysis
Material Selection – Metals	Cultural Enrichment elective
Advanced Technical Composition	Technical Presentations
Industrial Psychology	

* All Product Design graduates are required to complete a Senior Design Project. This project is an individual effort involving the design of a new product or the modification of an existing product (usually to add features, reduce cost and/or improve functionality).

PRODUCT DESIGN ENGINEERING TECHNOLOGY - PROGRAM SUMMARY

The Product Design Engineering Technology program at Ferris State University graduated its first class in May 1990. Typically the program provides 25 – 30 graduates each year for primarily Western Michigan employers. Most students attend class full time on campus in Big Rapids, however there are a number of working students who complete the same academic program at night in Grand Rapids. The Product Design program leads to a Bachelor's of Science degree and can be completed in two years of full time study. To be admitted into this program, all students must have completed at least an Associates Degree at Ferris State or some other accredited college or university in a technical area of study with approximately 60 transferrable semester credit hours. Typically most students start the Product Design program in their junior year after completing an Associates degree in Computer Aided Drafting, Pre-engineering, Mechanical Engineering Technology or Manufacturing Engineering Technology.

The primary focus of the Product Design program at Ferris State University is applied mechanical engineering with a CAD emphasis. All technical courses are application focused with minimum theoretical content. In these classes, most class time is spent on solving actual design problems. Derrivation of design equations and practices is only provided to the level necessary to understand critical concepts. Product Design students are required to use several software applications in their coursework, most notably ANSYS for Finite Element Analysis, AUTOCAD for conventional drawings and PRO-ENGINEER for parametric modelling and 3D design.

Product Design Engineering Academic Program;

1st Semester

Seminar in design principles
Geometric Dimensioning & Tol.
Basic Electronics
Statics & Strengths of Materials
Basic Art (artistic rendering)
Basic Chemistry

2nd Semester

Applied Engineering Dynamics
CAD Solid Modeling (PRO-E)
Design for Manufacturing
Material Selection – Plastics
Applied Calculus
Introduction to Psychology

3rd Semester

Machine Design
Statistics & Ergonomics
Applied Fluids & Thermodynamics
Material Selection – Metals
Advanced Technical Composition
Industrial Psychology

4th Semester

Senior Design Project *
Advanced Machine Design with FEA (ANSYS)
Testing Systems & Analysis
Cultural Enrichment elective
Technical Presentations

* All Product Design graduates are required to complete a Senior Design Project. This project is an individual effort involving the design of a new product or the modification of an existing product (usually to add features, reduce cost and/or improve functionality).

Ferris State University Product Design Engineering - Industrial Survey

1. Approximately how many employees work at this facility ?

2. Approximately how many Mechanical engineers / designers work at this facility ?

3. What description best fits your company's primary activity ? (check all that apply)

   ___Manufacturing ___Design ___Consulting ___ Other_____

4. Does the company currently have a Ferris State University Product Design graduate on staff ?

   Yes No Unknown

5. If so, how well do you feel that the Ferris State graduate(s) was/were prepared to work for your company?

   Very well prepared About Average Not prepared Not Applicable

6. The following are the major subject areas in Ferris State University's Design Engineering program. Please indicate the relative importance you feel that this subject / skill would have if you were seeking to hire a recent graduate for your technical staff.

   5 – Very Important
   4 - Somewhat important
   3 - Neutral or I am not familiar with this subject
   2 - Of marginal value
   1 - Of no value

____Geometric Dimensioning and Tolerancing (GD&T)	____Machine Design
____Basic Material Science	____Thermodynamics
____Designing with Plastics	____Fluid Mechanics
____Designing with Metals	____Basic Electronics
____Engineering Statics	____CAD surfacing & 3D modelling
____Engineering Dynamics	____Ergonomics
____Chemistry	____Statistics
____Physics	____Product rendering & sketching
____Finite Element Analysis (FEA)	____Manual Drafting
____Failure Mode Effects Analysis (FMEA)	____Industrial Psychology
____Design for manufacturing	____Applied Calculus

7. Approximately what percentage of your new engineering drawings are developed in CAD (as opposed to being developed by manual drafting) ?

   _____

8. If you currently develop CAD based drawings, what software package do you use ? (If you use more than one indicate the relative percentages used for new product development.)

____AUTOCAD ____PRO-E ____CATIA ____UNIGRAPHICS

____ OTHER (Please Specify) _____

9. All Product Design students at Ferris State are required to complete an individual design project during their senior year. This project consists of the design of a new product or the major modification of an existing product. Students are required to submit a technical proposal describing the design objective and justification for their project. In order to have their proposal accepted, they must also submit a reasonably detailed time and material budget for each planned design task. Once the proposal is accepted, the project is directed and managed by the student with only periodic status reports required. At the end of their senior year each student is required to provide a formal written technical report describing their project and a model or prototype of their design. Each student is then required to make a formal presentation about the project to the faculty.

   Overall does this seem to be a worthwhile activity ? _____ (5-very worthwhile ... 1-not important)

   The specific skills intended to be developed by completing the senior project are listed below. Using the same scale as used for question 6 (i.e. 5-very important ... 1-not important), please rate the relative importance that you would place on each skill.

   ____ Proposal Preparation (including concepting and estimating)

   ____Written Status reporting ____Project management

   ____Formal written report ____Prototype development

   ____Technical Presentation

10. During the last year has your company experienced difficulty in hiring qualified mechanical designers?

    ____ Yes ____ No _____ Do not know / Not applicable

11. In your opinion, describe the growth potential for mechanical design at your company during the next year. (circle the best estimate)

    Probable expansion in design staff Average/Steady Probable reduction in staff
    5 4 3 2 1

12. In the space below please identify any changes or additions would you recommend for the Product Design program at Ferris State University and /or provide any general comments that you would like to have evaluated.

Please return this survey using the addressed, stamped envelope provided. Try to return your response by August 4, 2000.

Thank you for your help in evaluating the Product Design Program.

APPENDIX D

Supporting information for Section 4 – Student Evaluations

Student Evaluation - Survey Instrument

As administered to the May 1999 and May 2000 graduating Senior class.

The following courses are defined as part of the standard PDET program. Please evaluate each course by rating each category from 0 (worst) to 5 (best). If you do remember the course or did not take it, please leave the row blank.

	Instructor (if known)	Technical Difficulty	Workload	Teaching Quality	Value
PDET 311					
PDET 312					
EEET 318					
MECH 240					
ARTS 101					
CHEM 103					
PDET 321					
PDET 322					
MFGE 352					
PLTS 342					
MATH 216					
PSYC 150					
PDET 411					
PDET 412					
PDET 413					
MATL 341					
PSYC 326					
ENGL 321					

PDET 499	_____	_____	_____	_____	_____
PDET 422	_____	_____	_____	_____	_____
HSET 403	_____	_____	_____	_____	_____
COMM 336	_____	_____	_____	_____	_____

What course did you take as a cultural enrichment elective ? _____

Would you recommend this course to future PDET students YES NO

In your opinion what is the best course(s) (overall) in the program ?

What is the worst course(s) in the program ?

OVERALL, ARE YOU SATISFIED WITH YOUR PDET EDUCATION

5 Very satisfied .....3 Moderately.....0 Not satisfied

Please add any comments about the program that you feel are appropriate;

PDET 499	_____	_____	_____	_____	_____
PDET 422	_____	_____	_____	_____	_____
HSET 403	_____	_____	_____	_____	_____
COMM 336	_____	_____	_____	_____	_____

What course did you take as a cultural enrichment elective ? _____

Would you recommend this course to future PDET students YES NO

In your opinion what is the best course(s) (overall) in the program ?

What is the worst course(s) in the program ?

OVERALL, ARE YOU SATISFIED WITH YOUR PDET EDUCATION

5 Very satisfied .....3 Moderately.....0 Not satisfied

Please add any comments about the program that you feel are appropriate;

The following courses are defined as part of the standard PDET program. Please evaluate each course by rating each category from 0 (worst) to 5 (best). If you do remember the course or did not take it, please leave the row blank.

	Instructor (if known)	Technical Difficulty	Workload	Teaching Quality	Value
PDET 311					
PDET 312					
EEET 318					
MECH 240					
ARTS 101					
CHEM 103					
PDET 321					
PDET 322					
MFGE 352					
PLTS 342					
MATH 216					
PSYC 150					
PDET 411					
PDET 412					
PDET 413					
MATL 341					
PSYC 326					
ENGL 321					

APPENDIX E

Survey Instrument for Section 5 – Faculty Perceptions

FACULTY PERCEPTIONS

2000 PROGRAM REVIEW SURVEY

PRODUCT DESIGN ENGINEERING TECHNOLOGY

The Product Design Engineering Technology program is seeking your input for its 2000 Academic Program Review. This survey is being sent to a large sample of Ferris State University faculty who have had direct interaction with a large percentage of recent PDET students. The purpose of this survey is to identify areas of improvement in the selection of new PDET students and the PDET curriculum here at FSU as it is currently defined. It is recognized that your observations and suggestions may be quite limited due to a limited amount of contact with PDET students. It is, however, critically important that you complete this survey since the information provided will be used to modify admission criteria and the program curriculum.

When you have completed this survey please return it via campus mail to _____ not later than ******. Thank you for your help.

Please describe the extent of your experience with PDET students ;

_____

_____

_____

1. I would describe the preparation of the typical PDET student for my course as follows when compared to other members of the FSU student population.

Better Prepared		Average		Inadequately Prepared
1	2	3	4	5

Comments _____

2. I would rate the written communication skills of the typical PDET student relative to those of other FSU students.

Better		Average		Inadequate
1	2	3	4	5

3. I would rate the verbal communication skills of the typical PDET student relative to those of other FSU students.

Better		Average		Inadequate
1	2	3	4	5

4. I would rate the quantitative skills of the typical PDET student relative to those of other FSU students.

Better		Average		Inadequate
1	2	3	4	5

5. I would rate the problem solving skills of the typical PDET student relative to those of other FSU students.

Better		Average		Inadequate
1	2	3	4	5

6. The following is a simplified checklist of the current PDET admission requirements. About 50% of a typical PDET class completes these requirements as part of their Pre-PDET study at colleges and universities other than FSU. The remaining 50% of a PDET class complete these requirements during an Associates degree program here at Ferris. Please identify, for those areas which you feel comfortable in voicing an opinion, the relative importance of the current requirement and any additional admission requirements which you feel should be incorporated.

PLEASE FEEL FREE TO LEAVE AN ENTRY BLANK IF YOU HAVE NO OPINION

	Very Important		Somewhat Important		Not Important
ENGL 150 & 250 or equiv.	1	2	3	4	5
COMM 105 / 121 or equiv.	1	2	3	4	5
PHYS 211 or equiv.	1	2	3	4	5
MATH 126 or equiv.	1	2	3	4	5
A Basic CAD course	1	2	3	4	5
A Basic Materials course	1	2	3	4	5
A Social Awareness Course	1	2	3	4	5
A Cultural Enrichment course	1	2	3	4	5

Courses / Requirements which should be added;

_____

_____

_____

_____

_____

APPENDIX F

Supporting information for Section 6 – Industry Advisory Board Perceptions

Product Design Industrial Advisory Board (June 17, 2000)

Industrial Advisory Committee Evaluation - Survey Instrument

PRODUCT DESIGN ENGINEERING TECHNOLOGY
ADVISORY BOARD
updated June 17, 2000

Mr. Robert Von Berge
Manager, Electric Vehicle Build
DaimlerChrysler
CIMS 482-20-01
800 Chrysler Drive East
Auburn Hills, MI 48326-2757
Phone: 248-576-2824
Fax: 248-576-2018

Mr. Marc Clevenger
Engineering Manager
Overhead Products Group Interiors
Johnson Controls, Inc.
Automotive Systems Group
921 East 32nd Street
Holland, MI 49423
Phone: 616-394-8924
Fax: 616-394-8974
E-mail:marc_clevenger@jci.com

Mr. Jerry Redmann
Operations Manager
Products Support Operations
Rapistan Demag Inc.
MC G5
507 Plymouth Ave., NE
Grand Rapids, MI 49505-6098
Phone: 616-242-7921
Fax: 616-732-2394
E-mail:redmannjl@rapistan.com

Ms. Renee Scott
Project Engineer
N.A. Car Group, General Motors
Mail Code 480-111-W15
30200 Mound Rd. 1-11
Box 9010
Warren, MI 48090-9010
Phone: 810-986-5206
Fax: 810-986-8402
E-mail: renee.baker@gm.com

Mr. Don Eenigenburg
Department Manager
Smiths Industries
Product Engineering & Testing
3290 Patterson SE
Grand Rapids, MI 49512-1991
Phone: 616-241-7422
Fax: 616-241-7965
E-mail:eenigenburg_don@si.com

Mr. Maury Fredricks
Co-CEO
Fredricks Design, Inc.
201 Washington
Grand Haven, MI 49417
Phone: 616-850-4500
Fax: 616-846-8665
E-mail:maury@fredricks.com

Mr. William Gerding
Product Designing Engineer
Wedin International, Inc.
1111 Sixth Ave.
Cadillac, MI 49601
Phone: 616-779-8650
Fax: 616-779-8673

FERRIS STATE UNIVERSITY
Product Design Engineering Technology
Industrial Advisory Committee Evaluation

NAME:_____ **(PLEASE PRINT)**
COMPANY:_____
MAILING ADDRESS: _____
_____

Member of the Ferris State's Product Design Engineering Technology program Advisory Committee meeting of 6/10/99.

You recently attended an advisory committee meeting for the above program. We would like to know what you thought of the process; how the process could be improved; and your overall perception of the curriculum based on the materials examined, facilities visited, and input received from program faculty.

	Excellent				Poor
1. How would you rate the organization of this meeting	**5**	**4**	**3**	**2**	**1**
2. How would you rate the receptivity and openness of the program faculty and staff	**5**	**4**	**3**	**2**	**1**
3. How would you rate luncheon and meeting facilities	**5**	**4**	**3**	**2**	**1**
4. How would you rate the curriculum you reviewed and analyzed	**5**	**4**	**3**	**2**	**1**

5. How could we improve the meeting?

_____

6. What additional information or material about the PDET program would you like to receive?

_____

7. How might we better serve you and your company in the future?

_____

Thank you for your comments. Please return this evaluation to the secretary at the end of this meeting. If you are unable to do so, the mailing address is: Ferris State University, Design & Manufacturing, 915 Campus Drive, Swan Building 109, Big Rapids, MI 49307-2291. We thank you for your support of our program and Ferris State University.

h:\users\faysall\forms\adveval.doc

APPENDIX G

Supporting information for Section 7 - Labor Market Analysis

The following information, obtained via internet from the U.S. Department of Labor - Bureau of Labor Statistics webb site, is part of its Occupational Outlook Handbook. It is provided as an Appendix to this report to provide the interested reader with additional specific information relating to the BLS forecast for the two employment categories most applicable to Ferris State Product Design graduates.

For Mechanical Engineers	- Occupational Description *(provides a description of the nature of the work, job outlook and earnings)*
	- Education Level Report *(provides a specific projection of employment growth and earnings)*
	- Occupation Report *(provides a distribution of the employment category by industry)*
For Designers	- Occupational Description
	- Education Level Report
	- Occupation Report

U.S. Department of Labor
Bureau of Labor Statistics
Accessibility Information
Occupational Outlook Handbook 2000-01 Edition
OCCUPATIONS
Management
Professional and Technical
Sales
Administrative Support
Service
Mechanics
Construction
Production
Transportation
Laborers and Helpers
Job Opportunities in the Armed Forces
Career Guide to Industries
OOQ Online
Employment Projections
Publications Home
BLS Home

Mechanical Engineers

Nature of the Work | Employment | Job Outlook | Earnings

Download a printer-friendly version (PDF 42K)

Nature of the Work [About this section] Top

Mechanical engineers research, develop, design, manufacture and test tools, engines, machines, and other mechanical devices. They work on power-producing machines such as electricity-producing generators, internal combustion engines, steam and gas turbines, and jet and rocket engines. They also develop power-using machines such as refrigeration and air-conditioning equipment, robots used in manufacturing, machine tools, materials handling systems, and industrial production equipment. Mechanical engineers also design tools needed by other engineers for their work.

Mechanical engineers work in many industries and their work varies by industry and function. Some specialties include applied mechanics; computer-aided design and manufacturing; energy systems; pressure vessels and piping; and heating, refrigeration, and air-conditioning systems. Mechanical engineering is the broadest engineering discipline, extending across many interdependent specialties. Mechanical engineers may work in production operations, maintenance, or technical sales; many are administrators or managers.

Employment [About this section] Top

Mechanical engineers held about 220,000 jobs in 1998. Almost 3 out of 5 jobs were in manufacturing—mostly in machinery, transportation equipment, electrical equipment, instruments, and fabricated metal products industries. Engineering and management services, business services, and the Federal Government provided most of the remaining jobs.

Job Outlook [About this section] Top

Employment of mechanical engineers is projected to grow about as

fast as the average for all occupations though 2008. Although overall manufacturing employment is expected to decline, employment of mechanical engineers in manufacturing should increase as the demand for improved machinery and machine tools grows and industrial machinery and processes become increasingly complex. Employment of mechanical engineers in business and engineering services firms is expected to grow faster than average as other industries in the economy increasingly contract out to these firms to solve engineering problems. In addition to job openings from growth, many openings should result from the need to replace workers who transfer to other occupations or leave the labor force.

Earnings

[About this section] ▲ Top

Median annual earnings of mechanical engineers were $53,290 in 1998. The middle 50 percent earned between $42,680 and $74,220. The lowest 10 percent earned less than $35,290 and the highest 10 percent earned more than $87,000. Median annual earnings in the industries employing the largest numbers of mechanical engineers in 1997 were:

Federal government	$66,800
Engineering and architectural services	55,800
Electronic components and accessories	52,900
Aircraft and parts	51,800
Motor vehicles and equipment	48,500

According to a 1999 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in mechanical engineering received starting offers averaging about $43,300 a year; master's degree candidates, $51,900; and Ph.D. candidates, $64,300.

(See introduction to the section on engineers for information on working conditions, training requirements, and sources of additional information.)

O*NET Code: 22135 **About the O*NET codes**

▲ Top of Page

Occupational Employment, Training, and Earnings

Education Level Report

Below is the 1 selected occupation for which the typical education/training level is **Bachelor's degree**, sorted by **Average annual job openings due to growth and net replacement needs, 1998-2008**.

Occupation	Total employment (000's)		1998-2008 change in total employment		1998 percent self-employed	1998-2008 average annual job openings (000's)		Percent		Annual earning quartile
	1998	2008	Number (000's)	Percent		Due to growth and total replacement needs	Due to growth and net replacement needs	Part-time workers quartile*	Unemployed workers quartile*	
Mechanical engineers	220	256	36	16.4	2.0	9	8	VL	VL	VH

* VH = Very High; H = High; L = Low; VL = Very Low; n.a. = not available

| Home | Education Level Search | Occupation Search | About the Numbers | Related Information |

Employment Projections Home Page

BLS Home Page

Alan Eck
Bureau of Labor Statistics
eck_a@bls.gov
Last modified: November 30, 1999
URL: http://stats.bls.gov/oep/noeted/emprprt.asp

National Industry-Occupation Employment Matrix

Occupation Report

Below are items 1 through 10 of 211 industries employing **Mechanical engineers** sorted by **1998 employment**. (Re-sort this report.)

Note: Total, all industries is presented for comparison purposes.

Industry	1998 employment		Projected 2008 employment		Change, 1998-2008	
	Number	Percent distribution	Number	Percent distribution	Number	Percent
Total employment, all industries	219,654	100.00	255,744	100.00	36,091	16.4
Engineering and architectural services	34,616	15.76	46,091	18.02	11,475	33.1
Aircraft and parts	12,407	5.65	16,478	6.44	4,071	32.8
Federal government	10,047	4.57	9,292	3.63	-755	-7.5
Motor vehicles and equipment	9,644	4.39	9,710	3.80	66	0.7
Electronic components and accessories	7,052	3.21	9,128	3.57	2,076	29.4
General industrial machinery	6,834	3.11	7,405	2.90	570	8.3
Construction and related machinery	6,664	3.03	7,411	2.90	746	11.2
Metalworking machinery	6,150	2.80	6,087	2.38	-63	-1.0
Special industry machinery	5,788	2.63	6,467	2.53	679	11.7
Personnel supply services	5,358	2.44	8,494	3.32	3,135	58.5

Next 10

National Industry-Occupation Employment Matrix

Occupation Report

Below are items 11 through 20 of 211 industries employing **Mechanical engineers** sorted by **1998 employment**. (Re-sort this report.)

Note: Total, all industries is presented for comparison purposes.

Industry	1998 employment		Projected 2008 employment		Change, 1998-2008	
	Number	Percent distribution	Number	Percent distribution	Number	Percent
Total employment, all industries	219,654	100.00	255,744	100.00	36,091	16.4
Measuring and controlling devices	4,722	2.15	4,971	1.94	248	5.3
Research and testing services	4,720	2.15	6,907	2.70	2,186	46.3
Miscellaneous plastics products	4,248	1.93	5,284	2.07	1,036	24.4
Medical instruments and supplies	4,112	1.87	5,230	2.04	1,118	27.2
Heavy construction, except highway and street	3,984	1.81	4,354	1.70	370	9.3
Search and navigation equipment	3,720	1.69	3,356	1.31	-364	-9.8
Industrial machinery, nec	3,581	1.63	3,935	1.54	354	9.9
Machinery, equipment, and supplies	3,411	1.55	3,777	1.48	366	10.7
Self-employed workers, primary job	3,135	1.43	3,560	1.39	425	13.5
Engines and turbines	3,074	1.40	2,167	0.85	-907	-29.5

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Designers

Significant Points

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- Four out of 10 designers are self-employed—almost four times the proportion for all professional specialty occupations.
- Creativity is crucial in all design occupations; formal education requirements range from a high school diploma for floral designers to a bachelor's degree for industrial designers.
- Despite projected faster-than-average employment growth, keen competition is expected for most jobs, because many talented individuals are attracted to careers as designers.

Nature of the Work

[About this section] Top

Designers are people with a desire to create. They combine practical knowledge with artistic ability to turn abstract ideas into formal designs for the clothes that we wear, the living and office space that we inhabit, and the merchandise that we buy. Designers usually specialize in a particular area of design, such as automobiles, clothing, furniture, home appliances, industrial equipment, interiors of homes or office buildings, movie and theater sets, packaging, or floral arrangements.

The first step in developing a new design or altering an existing one is to determine the needs of the client and the ultimate function for which the design is intended. When creating a design, the designer considers size, shape, weight, color, materials used, cost, ease of use, and safety.

The designer then prepares sketches—by hand or with the aid of a computer—to illustrate the vision for the design. After consulting with the client, an art or design director, or a product development team, the designer creates a detailed design using drawings, a

structural model, computer simulations, or a full-scale prototype. Many designers are increasingly using computer-aided design (CAD) tools to create and better visualize the final product. Computer models allow greater ease and flexibility in making changes to a design, thus reducing design costs and cutting the time it takes to deliver a product to market. Industrial designers use computer-aided industrial design (CAID) to create designs and to communicate them to automated production tools.

Designers sometimes supervise assistants who carry out their creations. Designers who run their own businesses also may devote a considerable amount of time to developing new business contacts and to performing administrative tasks, such as reviewing catalogues and ordering samples.

Design encompasses a number of different fields. Many designers specialize in a particular area of design, whereas others work in more than one. *Industrial designers* develop countless manufactured products, including airplanes; cars; home appliances; children's toys; computer equipment; and medical, office, and recreational equipment. They combine artistic talent with research on product use, marketing, materials, and production methods to create the most functional and appealing design and to make the product competitive with others in the marketplace. Most industrial designers concentrate in an area of sub-specialization, such as kitchen appliances.

Furniture designers design furniture for manufacture. These designers use their knowledge of design trends, competitors' products, production costs, production capability, and characteristics of a company's market to create home and office furniture that is both functional and attractive. They also may prepare detailed drawings of fixtures, forms, or tools required in the production of furniture. Some furniture designers fashion custom pieces or styles according to a specific period or country. Furniture designers must be strongly involved with the fashion industry and aware of current trends and styles.

Interior designers plan the space and furnish the interiors of private homes, public buildings, and commercial or institutional establishments, such as offices, restaurants, hospitals, hotels, and theaters. They also plan the interiors for additions to and renovations of existing structures. Most interior designers specialize, and some further specialize in a related line of work. For example, some may concentrate in residential design, and others may further specialize by focusing on a particular room, such as kitchens or baths. With a client's tastes, needs, and budget in mind, interior designers prepare drawings and specifications for interior

construction, furnishings, lighting, and finishes. Increasingly, designers use computers to plan layouts that can be changed easily to include ideas received from the client. Interior designers also design lighting and architectural details, such as crown molding, coordinate colors and select furniture, floor coverings, and curtains. Interior designers must design space to conform to Federal, State, and local laws, including building codes. Design plans for public areas also must meet accessibility standards for the disabled and elderly.

Set, lighting, and costume designers create set, lighting, and costume designs for movie, television, and theater productions. They study scripts, confer with directors and other designers, and conduct research to determine the appropriate historical period, fashion and architectural styles.

Fashion designers design clothing and accessories. Some high-fashion designers are self-employed and design for individual clients. Other high-fashion designers cater to specialty stores or high fashion department stores. These designers create original garments, as well as follow established fashion trends. Most fashion designers, however, work for apparel manufacturers, adapting designs of men's, women's, and children's fashions for the mass market.

Textile designers, using their knowledge of textile materials and fashion trends, design fabric for garments, upholstery, rugs, and other products. Computers are widely used in pattern design and grading; intelligent pattern engineering (IPE) systems enable great automation in generating patterns.

Floral designers cut and arrange live, dried, or artificial flowers and foliage into designs, according to the customer's order. They trim flowers and arrange bouquets, sprays, wreaths, dish gardens, and terrariums. They usually work from a written order indicating the occasion, customer preference for color and type of flower, price, and the date, time, and place the floral arrangement or plant is to be ready to be delivered. The variety of duties performed by a floral designer depends on the size of the shop and the number of designers employed. In a small operation, the floral designer may own the shop and do almost everything, from growing and purchasing flowers to keeping financial records.

Merchandise displayers and window dressers plan and erect commercial displays, such as those in windows and interiors of retail stores and at trade exhibitions.

Working Conditions [About this section] Top

Working conditions and places of employment vary. Designers employed by manufacturing establishments or design firms generally work regular hours in well-lighted and comfortable settings. Self-employed designers tend to work longer hours.

Designers frequently adjust their workday to suit their clients' schedules, meeting with them during evening or weekend hours, when necessary. Designers may transact business in their own offices, clients' homes or offices, or they may travel to other locations, such as showrooms, design centers, and manufacturing facilities.

Industrial designers usually work regular hours but occasionally work overtime to meet deadlines. In contrast, set, lighting, and costume designers work long and irregular hours, and they often are under pressure to make rapid changes. Fashion designers may work long hours, particularly during production deadlines or before fashion shows, when overtime usually is necessary. In addition, fashion designers may be required to travel to production sites across the United States and overseas. Interior designers generally work under deadlines and may work overtime to finish a job. They regularly carry heavy and bulky sample books to meetings with clients. Floral designers usually work regular hours in a pleasant work environment, except during holidays when overtime usually is required.

All designers face frustration at times, when their designs are rejected or when they cannot be as creative as they wish. Independent consultants, who are paid by the assignment, are under pressure to please clients and to find new ones to maintain an income.

Employment

[About this section] Top

Designers held about 423,000 jobs in 1998. Four out of 10 were self-employed.

Designers work in a number of different industries, depending on their design specialty. Most industrial designers, for example, work for engineering or architectural consulting firms or for large corporations. Interior designers usually work for furniture and home furnishings stores, interior designing services, and architectural firms. Many interior designers do freelance work—full time, part time, or in addition to a salaried job in another occupation.

Set, lighting, and costume designers work for theater companies and

film and television production companies. Fashion designers generally work for textile, apparel, and pattern manufacturers, or for fashion salons, high-fashion department stores, and specialty shops. Most floral designers work for retail flower shops or in floral departments located inside grocery and department stores.

Training, Other Qualifications, and Advancement

[About this section] Top

Creativity is crucial in all design occupations. People in this field must have a strong sense of the aesthetic—an eye for color and detail, a sense of balance and proportion, and an appreciation for beauty. Sketching ability is helpful for most designers, but it is especially important for fashion designers. A good portfolio—a collection of examples of a person's best work—is often the deciding factor in getting a job. Except for floral design, formal preparation in design is necessary.

Educational requirements for entry-level positions vary. Some design occupations, notably industrial design, require a bachelor's degree. Interior designers normally need a college education, in part because few clients—especially commercial clients—are willing to entrust responsibility for designing living and working space to a designer with no formal credentials.

Interior design is the only design field subject to government regulation. According to the American Society for Interior Designers, 21 States and the District of Columbia require interior designers to be licensed. Because licensing is not mandatory in all States, an interior designer's professional standing is important. Membership in a professional association usually requires the completion of 3 or 4 years of postsecondary education in design, at least 2 years of practical experience in the field, and passage of the National Council for Interior Design qualification examination.

In fashion design, employers seek individuals with a 2- or 4-year degree who are knowledgeable in the areas of textiles, fabrics, and ornamentation, as well as trends in the fashion world. Similarly, furniture designers must keep abreast of trends in fashion and style, in addition to methods and tools used in furniture production. Several universities and schools of design offer degrees in furniture design.

Set, lighting, and costume designers typically have college degrees in their particular area of design. A Master of Fine Arts (MFA) degree from an accredited university program further establishes

one's design credentials. Membership in the United Scenic Artists, Local 829, is a nationally recognized standard of achievement for scenic designers.

In contrast to the other design occupations, a high school diploma ordinarily suffices for floral design jobs. Most floral designers learn their skills on the job. When employers hire trainees, they generally look for high school graduates who have a flair for color and a desire to learn. Completion of formal training, however, is an asset for floral designers, particularly for advancement to the chief floral designer level. Vocational and technical schools offer programs in floral design, usually lasting less than a year, while 2- and 4-year programs in floriculture, horticulture, floral design, or ornamental horticulture are offered by community and junior colleges, and colleges and universities.

Formal training for some design professions also is available in 2- and 3-year professional schools that award certificates or associate degrees in design. Graduates of 2-year programs normally qualify as assistants to designers. The Bachelor of Fine Arts degree is granted at 4-year colleges and universities. The curriculum in these schools includes art and art history, principles of design, designing and sketching, and specialized studies for each of the individual design disciplines, such as garment construction, textiles, mechanical and architectural drawing, computerized design, sculpture, architecture, and basic engineering. A liberal arts education, with courses in merchandising, business administration, marketing, and psychology, along with training in art, also is a good background for most design fields. Additionally, persons with training or experience in architecture qualify for some design occupations, particularly interior design.

Computer-aided design (CAD) increasingly is used in all areas of design, except floral design, so many employers expect new designers to be familiar with the use of the computer as a design tool. For example, industrial designers extensively use computers in the aerospace, automotive, and electronics industries. Interior designers use computers to create numerous versions of interior space designs—making it possible for a client to see and choose among several designs; images can be inserted, edited, and replaced easily and without added cost. In furniture design, a chair's basic shape and structure may be duplicated and updated, by applying new upholstery styles and fabrics with the use of computers.

The National Association of Schools of Art and Design currently accredits about 200 postsecondary institutions with programs in art and design; most of these schools award a degree in art. Some award degrees in industrial, interior, textile, graphic, or fashion

design. Many schools do not allow formal entry into a bachelor's degree program, until a student has finished a year of basic art and design courses successfully. Applicants may be required to submit sketches and other examples of their artistic ability.

The Foundation for Interior Design Education Research also accredits interior design programs and schools. Currently, there are more than 120 accredited programs in the United States and Canada, located in schools of art, architecture, and home economics.

Individuals in the design field must be creative, imaginative, persistent, and able to communicate their ideas in writing, visually, or verbally. Because tastes in style and fashion can change quickly, designers need to be well read, open to new ideas and influences, and quick to react to changing trends. Problem-solving skills and the ability to work independently and under pressure are important traits. People in this field need self-discipline to start projects on their own, to budget their time, and to meet deadlines and production schedules. Good business sense and sales ability also are important, especially for those who freelance or run their own business.

Beginning designers usually receive on-the-job training, and normally need 1 to 3 years of training before they advance to higher-level positions. Experienced designers in large firms may advance to chief designer, design department head, or other supervisory positions. Some designers become teachers in design schools and colleges and universities. Some experienced designers open their own firms.

Job Outlook

[About this section] Top

Despite projected faster-than-average employment growth, designers in most fields—with the exception of floral and furniture design—are expected to face keen competition for available positions. Many talented individuals are attracted to careers as designers. Individuals with little or no formal education in design, as well as those who lack creativity and perseverance, will find it very difficult to establish and maintain a career in design. Floral design should be the least competitive of all design fields because of the relatively low pay and limited opportunities for advancement, as well as the relatively high job turnover of floral designers in retail flower shops.

Overall, the employment of designers is expected to grow faster than the average for all occupations through the year 2008. In

addition to employment growth, many job openings will result from the need to replace designers who leave the field. Increased demand for industrial designers will stem from the continued emphasis on product quality and safety; the demand for new products that are easy and comfortable to use; the development of high-technology products in medicine, transportation, and other fields; and growing global competition among businesses. Rising demand for professional design of private homes, offices, restaurants and other retail establishments, and institutions that care for the rapidly growing elderly population should spur employment growth of interior designers. Demand for fashion, textile, and furniture designers should remain strong, because many consumers are concerned with fashion and style.

Earnings

[About this section] ▲ Top

Median annual earnings for designers in all specialties except interior design were $29,200 in 1998. The middle 50 percent earned between $18,420 and $43,940. The lowest 10 percent earned less than $13,780 and the highest 10 percent earned over $68,310. Median annual earnings in the industries employing the largest numbers of designers, except interior designers, in 1997 were as follows:

Engineering and architectural services	$41,300
Apparel, piece goods, and notions	38,400
Mailing, reproduction, and stenographic services	36,000
Retail stores, not elsewhere classified	16,500

Median annual earnings for interior designers were $31,760 in 1998. The middle 50 percent earned between $23,580 and $42,570. The lowest 10 percent earned less than $18,360 and the highest 10 percent earned over $65,810. Median annual earnings in the industries employing the largest numbers of interior designers in 1997 were as follows:

Engineering and architectural services	$33,000
Furniture and home furnishings stores	27,800
Miscellaneous business services	26,800

Median annual earnings of merchandise displayers and window dressers were $18,180 in 1998. The lowest 10 percent earned less than $12,680; the highest 10 percent, over $28,910.

According to the Industrial Designers Society of America, the average base salary for an industrial designer with 1 to 2 years of experience was about $31,000 in 1998. Staff designers with 5 years of experience earned $39,000 whereas senior designers with 8 years of experience earned $51,000. Industrial designers in managerial or executive positions earned substantially more—up to $500,000 annually; however, $75,000 to $100,000 was more representative.

Related Occupations [About this section] Top

Workers in other occupations who design or arrange objects, materials, or interiors to enhance their appearance and function include visual artists, architects, landscape architects, engineers, photographers, and interior decorators. Some computer-related occupations, including Internet page designers and webmasters, require design skills.

Sources of Additional Information [About this section] Top

Disclaimer: Links to non-BLS Internet sites are provided for your convenience and do not constitute an endorsement.

For an order form for a directory of accredited college-level programs in art and design (available for $15.00) or career information in design occupations, contact:

- National Association of Schools of Art and Design, 11250 Roger Bacon Dr., Suite 21, Reston, VA 20190.

For information on careers and a list of academic programs in industrial design, write to:

- Industrial Designers Society of America, 1142-E Walker Rd., Great Falls, VA 22066. Internet: http://www.idsa.org

For information on degree, continuing education, and licensure programs in interior design, contact:

- American Society for Interior Designers, 608 Massachusetts Ave. NE., Washington, DC 20002-6006.

For a list of schools with accredited programs in interior design, contact:

- Foundation for Interior Design Education Research, 60

Occupational Employment, Training, and Earnings

Education Level Report

Below is the 1 selected occupation for which the typical education/training level is **Bachelor's degree**, sorted by **Total employment in 1998**.

Occupation	Total employment (000's)		1998-2008 change in total employment		1998 percent self-employed	1998-2008 average annual job openings (000's)		Percent		Annual earnings quartile*
	1998	2008	Number (000's)	Percent		Due to growth and total replacement needs	Due to growth and net replacement needs	Part-time workers quartile*	Unemployed workers quartile*	
Designers, except interior designers	335	426	91	27.1	44.0	58	14	H	L	H

* VH = Very High; H = High; L = Low; VL = Very Low; n.a. = not available

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Employment Projections Home Page

BLS Home Page

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Last modified: November 30, 1999
URL: http://stats.bls.gov/oep/noeted/emprprt.asp

National Industry-Occupation Employment Matrix

Occupation Report

Below are items 1 through 10 of 181 industries employing **Designers, except interior designers** sorted by **2008 projected employment**. (Re-sort this report.)

Note: Total, all industries is presented for comparison purposes.

Industry	1998 employment		Projected 2008 employment		Change, 1998-2008	
	Number	Percent distribution	Number	Percent distribution	Number	Percent
Total employment, all industries	335,260	100.00	425,952	100.00	90,692	27.1
Self-employed workers, primary job	120,081	35.82	154,733	36.33	34,652	28.9
Used merchandise and retail stores, nec	50,848	15.17	72,114	16.93	21,266	41.8
Self-employed workers, secondary job	27,576	8.23	33,198	7.79	5,622	20.4
Engineering and architectural services	17,198	5.13	21,753	5.11	4,555	26.5
Wholesale trade, other	15,135	4.51	17,240	4.05	2,105	13.9
Mailing, reproduction, and stenographic services	8,550	2.55	14,174	3.33	5,624	65.8
Personnel supply services	4,354	1.30	7,868	1.85	3,514	80.7
Advertising	4,902	1.46	6,104	1.43	1,202	24.5
Miscellaneous business services	4,160	1.24	5,905	1.39	1,746	42.0
Manufactured products, nec	4,247	1.27	4,987	1.17	740	17.4

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National Industry-Occupation Employment Matrix

Occupation Report

Below are items 11 through 20 of 181 industries employing **Designers, except interior designers** sorted by **2008 projected employment**. (Re-sort this report.)

Note: Total, all industries is presented for comparison purposes.

Industry	1998 employment		Projected 2008 employment		Change, 1998-2008	
	Number	Percent distribution	Number	Percent distribution	Number	Percent
Total employment, all industries	335,260	100.00	425,952	100.00	90,692	27.1
Motor vehicles and equipment	4,504	1.34	4,739	1.11	235	5.2
Miscellaneous shopping goods stores	2,913	0.87	3,785	0.89	872	29.9
Management and public relations	2,023	0.60	3,536	0.83	1,512	74.7
Grocery stores	3,083	0.92	3,378	0.79	295	9.6
Commercial printing and business forms	3,166	0.94	3,316	0.78	150	4.7
Apparel	3,376	1.01	3,107	0.73	-269	-8.0
Furniture and homefurnishings stores	2,372	0.71	3,027	0.71	655	27.6
Computer and data processing services	1,518	0.45	2,989	0.70	1,472	97.0
Department stores	2,708	0.81	2,936	0.69	227	8.4
Miscellaneous fabricated textile products	1,969	0.59	2,655	0.62	686	34.8

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National Industry-Occupation Employment Matrix

Occupation Report

Below are items 21 through 30 of 181 industries employing **Designers, except interior designers** sorted by **2008 projected employment**. (Re-sort this report.)

Note: Total, all industries is presented for comparison purposes.

Industry	1998 employment		Projected 2008 employment		Change, 1998-2008	
	Number	Percent distribution	Number	Percent distribution	Number	Percent
Total employment, all industries	335,260	100.00	425,952	100.00	90,692	27.1
Newspapers	2,703	0.81	2,491	0.58	-211	-7.8
Machinery, equipment, and supplies	1,790	0.53	2,071	0.49	281	15.7
Paperboard containers and boxes	1,733	0.52	1,897	0.45	164	9.5
Federal government	1,933	0.58	1,868	0.44	-65	-3.4
Motion picture production and distribution	1,508	0.45	1,774	0.42	266	17.7
Retail nurseries and garden stores	1,327	0.40	1,646	0.39	320	24.1
Metalworking machinery	1,647	0.49	1,548	0.36	-98	-6.0
Museums and botanical and zoological gardens	922	0.28	1,389	0.33	467	50.6
Books	1,218	0.36	1,375	0.32	158	13.0
Periodicals	1,256	0.37	1,340	0.31	84	6.7

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APPENDIX H

Supporting information for Section 13 - Recommendations

Program Review Panel Evaluation (Average Scores Shown)

Appendix H

PROGRAM REVIEW PANEL EVALUATION

Program: Product Design Engineering Tech.

Instructions: Circle the number which most closely describes t he program you are evaluating.

1. Student Perception of Instruction **Average Score** 5

5	4	3	2	1
Currently enrolled students rate instructional effectiveness as extremely high.				Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program **Average Score** 5

5	4	3	2	1
Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.				Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program **Average Score** 5

5	4	3	2	1
Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.				Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates **Average Score** 5

5	4	3	2	1
Graduates easily find employment in field.				Graduates are sometimes forced to find positions out of their field.

5. Use of Information on Labor Market **Average Score** 5

5	4	3	2	1
The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop and evaluate the program.				The faculty and administrators do not use labor market data in planning or evaluating the program.

6. Use of Profession/Industry Standards **Average Score** 3.5

5	4	3	2	1

Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

7. Use of Student Follow-up Information **Average Score** 5

5	4	3	2	1

Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

8. Relevance of Supportive Courses **Average Score** 4.25

5	4	3	2	1

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

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

9. Qualifications of Administrators and Supervisors **Average Score** 3.0

5	4	3	2	1

All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing **Average Score** 4.25

5	4	3	2	1

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

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

11. Facilities **Average Score** 2.5

5	4	3	2	1

Present facilities are sufficient to support a high quality program.

Present facilities are a major problem for program quality.

12. Scheduling of Instructional Facilities **Average Score** 3.0

5 4 3 2 1

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

Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment **Average Score** 1.75

5 4 3 2 1

Present equipment is sufficient to support a high quality program.

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

14. Adaption of Instruction **Average Score** 4.75

5 4 3 2 1

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

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies **Average Score** 4.25

5 4 3 2 1

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

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