COMPUTER AIDED ENGINEERING
Needs Assessment

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Executive Summary

- This assessment was conducted in order to assist the College Curriculum Committee in its consideration of the feasibility of creating a Computer Aided Engineering (CAE) option within the Computer Aided Design (CAD) program at OCC.

- Experts in the field and employers suggest that students who have an Associate's Degree in CAD with an Option in CAE might have an advantage in hiring, as employers are increasingly hiring CAD technicians with specialized computer aided engineering training to replace staff engineers.

- Start-up costs for the new option will be minimal, as classroom space is currently available, and hardware and software are already in place. Operation costs will include instruction and upgrades of equipment and software.

- Student Headcount in CAD courses at OCC has increased by 98.3% and Student Credit Hours have increased by 109.8% over the past 10 years.

- OCC's current CAD program is considered an extended degree program, requiring approximately 76 credits for an Associate's Degree. The new option in CAE would also be an extended degree program, requiring approximately 70 credits.

- Seventy-nine employers of CAD personnel and 210 recent OCC students in CAD were polled regarding whether an option in CAE would be desirable. Ninety-three percent of employers indicated that there is a demand for CAE-trained CAD personnel in the workplace, and 92.9% of students indicated that an option in CAE is a good idea.

- Employer comments suggest that OCC would be well-advised to keep abreast of the current applications and software used in industry, and to offer instruction in those applications and software packages.

- The CAE applications most frequently noted by employers to be desirable in a new CAE option include virtual reality, stereolithography, and kinematics. Employers were least enthusiastic about a course in design for assembly in the proposed option.

- Several colleges (both 2- and 4-year) in Michigan offer courses in computer aided design (or computer aided drafting) as a part of mechanical engineering technology or pre-engineering curricula. None of the colleges contacted offers an associate's degree in computer aided engineering. The colleges that offer courses in the applications proposed for the OCC option are typically 4-year engineering programs.

- Students in the CAD program currently are highly employed, with over three quarters being employed full-time, and another 9% being employed part-time. Approximately 15% of students polled are unemployed. Of the students polled, 84% are taking courses in CAD in order to begin a new career, 65% are taking courses for personal interest, and 75% are taking courses in order to get an Associate's degree (multiple responses were allowed).

- Over half (52%) of surveyed students indicated that they would consider enrolling in the CAE option if it were offered, while another 38% indicated that they might consider the option.

- Student comments regarding the possibility of a CAE option in the CAD program were overwhelmingly positive. Concerns were primarily focused on the lack of adequate CAD lab time, and overcrowded laboratories and classrooms in the current CAD lab.

Oakland Community College
Proposed Computer Aided Engineering Option (CAD Program)
Needs Assessment

INTRODUCTION

The purpose of this report is to evaluate community need for a Computer Aided Engineering (CAE) option within the Computer Aided Design (CAD) program at Oakland Community College. This assessment was initiated by Dean Cheryl Krakow at the OCC Auburn Hills Campus at the request of faculty members in the technology department at OCC. This report is designed to identify employer needs as well as current trends in the field which could influence the viability of the proposed program.

The following assessment incorporates a review of related literature, employment statistics (provided by The Occupational Outlook Handbook, Michigan Employment Security Commission, and the Michigan Occupational Information System) and information supplied by employers, OCC students, and professional associations. In addition, program coordinators and faculty members involved with similar programs at other institutions were contacted.

Need for the Proposed Option

Faculty members in the CAD program at OCC believe that students with training in CAD with an option in Computer Aided Engineering would have a significant advantage in hiring. Further, the faculty believe that CAE graduates would command higher salaries and opportunities for career advancement than would CAD students without the CAE option. It is believed that students who hold Associate Degrees in CAD with an option in CAE will compete very effectively in the workplace, as the positions for which they will compete are currently being held by engineers and other high-cost personnel. CAE-trained Associate Degree holders could potentially reduce employer costs by accomplishing much of the design, analysis and testing work that is currently being done by highly educated and high-cost engineers. Such a phenomenon, if it is shown to be true, will enhance the employability of OCC students, and will benefit industry by reducing costs without sacrificing quality.

Technology faculty at OCC believe that the proposed CAE option in the CAD program will attract new students with a career interest in the engineering side of design and analysis, as well as established professionals wishing to enhance their chances for career advancement or salary increases. Rapid advances in computer technology are prompting employers to seek personnel with up-to-date training in computer applications, particularly computer design, analysis, and non-destructive testing procedures. OCC students with a CAE option will be trained on state-of-the-art equipment and software, and are expected to compete very well in that demanding market.

Cost of Proposed Option

The proposed CAE option is not expected to require substantial financial investment for start-up. Hardware and software necessary for courses and lab work in Computer Aided Engineering are already in existence in the CAD laboratory. Additionally, a specially equipped room has been set aside as classroom and laboratory space. Potential costs may be incurred through the hiring of additional instructional staff and paraprofessional assistants, although enrollments would be expected to support these instructional costs. Technological advances are occurring constantly; therefore, upgrades of equipment and software may have substantial financial implications for planning in the long run.

Current CAD Offerings

The Associate Degree in Computer Aided Design Technology (CAD) currently offered by OCC is designed to prepare students for entry level positions in the field of computer aided design and drafting. Student head count and credit hours in the CAD program at OCC have increased over the past 10 years (See Table 1).

Table 1

Trends in Annual Student Headcount and Annual Student Credit Hours*
Computer Aided Design (CAD)

Table 1 and Figure 1 depict total annual student enrollment (duplicated headcount) and total student credit hours for a ten year period. Data is based on the official count date for each CAD course which was offered throughout the academic year.

	1983-84	1984-85	**	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	Percent Change Ten Year
Student Headcount	926	678	**	1,057	1,081	1,199	1,342	1,468	1,678	1,836	98.3
Student Credit Hours	2,778.0	2,034.0	**	3,171.0	3,243.0	3,627.0	4,071.0	4,489.0	5,227.0	5,828.0	109.8

Figure 1
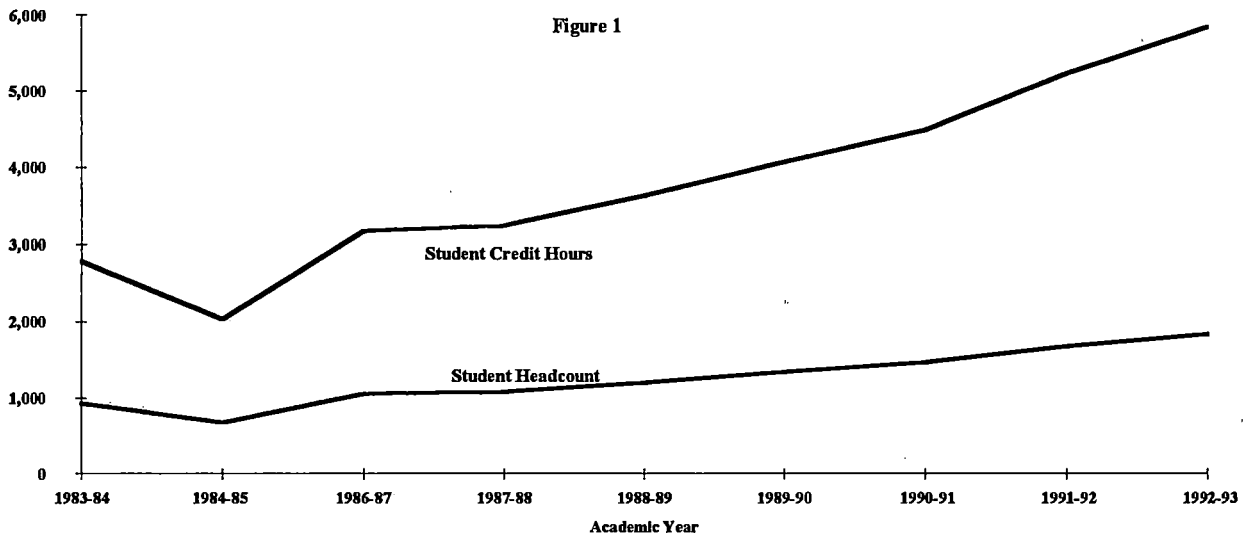
*Students represent annual duplicated headcount.
** Data for academic year 1985-86 is not available.

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Options currently offered within the CAD program include Automotive Body Design and Drafting, Machine Tool, and Plastics/Composites Applications. Graduates of the CAD program are prepared for employment in engineering and manufacturing design industries that use computer technology for drafting and design. Current CAD degree requirements are shown in Table 2 below[1]:

Table 2
OCC CAD Degree Requirements

CAD Major Requirements		(15 credits)
CAD 110*	Introduction to Computer Aided Design and Drafting	3
CAD 120*	Product Drafting	3
CAD 130*	Descriptive Geometry/Assembly Drawing	3
CAD 210.1*	Three Dimensional Wire Frame Design and Surfacing	3
CAD 220*	Product Design and Layout	3

Required Supportive Courses		(36 credits)
CAD 145	Drafting and Design Co-op Internship	3
CAD 245	Advanced Drafting and Design co-op Internship	3
DDT 100*	Fundamentals for the Drafting Industry	3
DDT 105*	Product Drafting	3
DDT 115*	Descriptive Geometry	3
ECT 208	Introduction to Microprocessors	3
ENG 151	Composition I	3
MAT 154	College Algebra	3
MAT 156	Trigonometry	3
MEC 101	Introduction to Manufacturing Processes	3
MEC 102	Manufacturing and Fabrication Processes	3

One Specialty Option	(12-14 credits)

General Education Requirements	(19 credits)
Communications/English	3
Fine Arts/Humanities	3
Mathematical/Science[2]	3
Social Science	3
POL 151 (American Government)	3
One course from ENG 131, 135, 151[3], 152, 211, or 221	3
Physical Education	1

TOTAL CREDITS *CAD Program*	76[4] credits

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[1] A certificate may be granted after the student completes all courses indicated with an asterisk (*) and all the requirements of one of the options.

[2] MAT 154 or 156 (from the Required Supportive Courses) can be used to meet this requirement.

[3] ENG 151 (from the Required Supportive Courses) will meet this requirement.

[4] Assuming the credit for MAT 154/156 and ENG 151 is used to meet General Education Requirements for those subjects. Option credits are assumed to be 12 (an option with more or less credits would alter the total accordingly).

Proposed CAD Option in Computer Aided Engineering (CAE)

Table 3 outlines the anticipated requirements of the proposed option in CAE.

Table 3
Course Requirements: Proposed CAE Option (CAD Program)

Major Requirements		(16 credits)
CAD 110*	Introduction to Computer Aided Design and Drafting	3
CAD 120*	Product Drafting	3
CAD 130*	Descriptive Geometry/Assembly Drawing	3
CAD 210.1*	Three Dimensional Wire Frame Design and Surfacing	3
CAD 215	Advanced Surfaces	4

Required Supportive Courses		(24 credits)
CAD 145	Drafting and Design Co-op Internship	3
DDT 100*	Fundamentals for the Drafting Industry	3
DDT 105*	Product Drafting	3
DDT 115*	Descriptive Geometry	3
ENG 151	Composition I	3
MAT 154	College Algebra	3
MAT 156	Trigonometry	3
MEC 101	Introduction to Manufacturing Processes	3

CAE Specialty Option	(13-15 credits)
Kinematics	3
Solid Modeling	3
Finite Element Modeling and Analysis	3
Design for Assembly	3
Computer Aided NC Tool Path Generation	4

General Education Requirements	(19 credits)
Communications/English	3
Fine Arts/Humanities	3
Mathematics/Science	3
Social Science	3
POL 151 (American Government)	3
One course from ENG 131, 135, 151, 152, 211, or 221	3
Physical Education	1

TOTAL CREDITS, *CAE Option/CAD Program*	71[5] credits

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[5] Assuming the credit for MAT 154/156 and ENG 151 is used to meet General Education Requirements for those subjects. Option credits are assumed to be 12.

The planned option would include courses from the existing CAD program (specifically Design for Assembly, which is charted to become a credit course in the near future; and Computer Aided Manufacturing). These courses will be augmented with proposed courses in kinematics (motion), solid modeling, finite element modeling and analysis, and design for assembly. Depending upon the availability of laboratory facilities and financial support, courses in virtual reality and stereo-lithography would be included in the CAE offerings.

METHODOLOGY

Methods of Data Collection

Data was collected by means of a phone questionnaire to employers in the local area who employ people with computer aided design and engineering skills (Appendix A). The list of employers was obtained from lists maintained by OCC personnel, from CAD program advisory committee members, Duns List, and local phone directories (Appendix B). Employers from five major employment categories were contacted: engineering firms, automobile manufacturers, original equipment manufacturers, design and analysis firms, and job shops (See Table 4). A total of 79 local employers responded to the phone survey.

Table 4

CAD/CAE Employer Type

Employer Type	Number Responding	Percent of Total
Non-Automotive Engineering	3	3.8%
Automotive Engineering	38	48.1%
Original Equipment Manufacturer	9	11.4%
Design and Analysis Firm	2	2.5%
Job Shop	5	6.3%
Other	16	20.3%
Missing	6	
TOTAL	79	

Additional information regarding education and training needs in the field of computer aided design and engineering was solicited via phone conversations with faculty and administrators in CAD and CAE programs nationwide.

Students who had taken at least three CAD courses at OCC (at least one of which was in the 1993-94 academic year) were surveyed through a phone survey (Appendix C). A total of 210 students were contacted and interviewed regarding their current employment situations, their reasons for taking CAD courses, and their impressions of whether or not an option in CAE is a good idea for OCC.

Methods of Data Analysis

Frequency distributions and correlations were used in addition to qualitative analysis of the student and employer survey data. Narrative responses obtained from students and employers were analyzed for content and appear verbatim in Appendices D and E. Information regarding comparable academic programs and industry experts was summarized and appears in appropriate sections within the text of this document.

ANALYSIS

The Nature of the Occupation: Engineering

The Occupational Outlook Handbook (1994) outlines the field of engineering as being one in which the theories and principles of science and mathematics are use to solve practical technical problems. Engineers design, test and supervise the construction of products, systems and machinery used in industry as well as domestic settings. While most engineers are specialized (more than 25 major specialties are recognized by professional engineering societies), persons trained in engineering have basic knowledge and training that can be applied to many applications. Engineers often work closely with technicians (who have skills in design, basic analysis and testing of products and systems), and with specialists in scientific, other engineering and business occupations.

Engineers and engineering technicians increasingly use computers to conduct simulations that allow for non-destructive testing and analysis of their design work. They also spend much of their time consulting with other engineers and producing reports. Large projects often involve the work of many engineers and technicians, each working on specialized parts of the job.

Nature of the Field: Computer Aided Engineering (CAE)

Within the manufacturing field, the trend is increasingly toward computerized applications in design, development and production. This computerized process, often referred to as Computer Integrated Manufacturing (CIM), encompasses the procedures within engineering (Computer Aided Engineering -- CAE), design (Computer Aided Design -- CAD), manufacturing (Computer Aided Manufacturing -- CAM), and the networking between all the production processes (Management Information Systems -- MIS).

The advantages of employing computer technology in the design and production of manufactured items are many. Computerized engineering and design processes are essential for manufacturers who wish to obtain a competitive edge by assuring the shortest possible product development cycles. Further, manufacturers, in an effort to continue the process of downsizing their production staffs, are insisting that their employees have broad-based technological knowledge. Increasingly, team-oriented employers are expecting employees to be capable of interfacing with each other, and are requiring various team members to be capable of operating

computer systems, as well as interpreting and analyzing computerized information produced by other team members.

Occupational Outlook

The Occupational Outlook Handbook (1994) indicates that in 1992, engineers held 1,354,000 jobs in the U.S. Most of these positions were in manufacturing industries, including electrical and electronic equipment, aircraft and parts, machinery, scientific instruments, chemicals, automobiles, and metals. While numbers are not available for employment of technical support personnel, the nature of the field indicates that the employability of technicians as support personnel for those engineers is positive.

Salary and Employee Benefits

The Bureau of Labor Statistics (1993) indicates that the median yearly salary for an experienced engineering technician in 1992 was $28,800, while supervisory technicians' median income was $41,400 per year. Job opportunities for technical personnel in engineering-related fields is predicted to grow by 19% between 1992 and 2005.

Employment Outlook

Engineering is a field in which employment is considered to be relatively stable, and is expected to retain it's resiliency in the foreseeable future. Because of the fact that engineers and engineering technicians typically work on long-term research and development projects that are insulated from economic turns, they typically enjoy a greater degree of job security in industrial fields than do other employees in industry. However, for those working in industries such as aerospace and defense that are highly dependent upon the support of governmental contracts, employment is much more volatile (The Occupational Outlook Handbook, 1994).

Many employers and educators alike believe that the employment opportunities are diminishing for engineers (and conversely, increasing for technical personnel), as CAD and CAE technicians are increasingly being hired to do the functions previously performed by engineers. Fortune Magazine suggests that technically trained personnel are becoming the new "worker elite," and are no longer considered simply support for engineers, but are becoming the backbone of today's workforce:

> The sheer growth in the number of technicians and the diversity of occupations they hold bespeak a profound change in their importance to companies that hope to survive and thrive in an era of epochal change. Since 1950 the number of technical workers has increased nearly 300% -- triple the growth rate for the work force as a whole -- to some 20 million. With one out of every four new jobs going to a technical worker, the Bureau of Labor Statistics (BLS) forecasts that this army of technocompetents -- already the largest broad occupational category in the U.S. -- will represent a fifth of total employment within a decade (Fortune, August 22, 1994, p. 56).

These technicians are benefiting from increased job opportunities and respect in the workplace, and are commanding very desirable salaries.

Influences of Computer Technology on Employment Opportunities

Computers have permeated the engineering field very rapidly in the past few years. The Occupational Outlook Handbook (1994) suggests that increased productivity prompted by computerization of the engineering field might have resulted in fewer engineering jobs, if engineers had not embraced the use of sophisticated computer applications in their work. The opposite seems to have happened: engineering, as an occupational area, has employed computer technology to the advantage of the field, and engineers/technicians are now able to produce and analyze designs much more productively. Technicians trained in Computer Aided Design and Engineering are in demand within engineering fields, and are beginning to replace more highly paid engineers in designing, testing, and analyzing (Occupational Outlook Handbook (1994). Computerization of industrial functions suggests that it is imperative for those in engineering related fields to have computer skills and to remain up-to-date on technological advances in the field.

Dr. Craig Hoff of Lawrence Technological University's CAD program suggests that technicians who are able to perform the computerized functions must also be able to "recognize garbage" when they consider their results. This suggests that persons who are trained not only in the technical procedures involved in computer aided design, but who also are able to perform preliminary analysis "with a healthy dose of skepticism" are the most desirable employees in today's engineering workplace.

Training Needed

Engineers typically hold bachelor's degrees, master's degrees or doctorates in engineering, often specializing in one area of engineering (e.g., electrical, mechanical, civil, industrial, aerospace). On occasion, a person with a degree in mathematics or a scientific field may qualify for an engineering position. Technicians in engineering fields typically hold associates or bachelor's degrees in their specialization. Many colleges and universities offer associate degrees in engineering technology, that prepare students to work side-by-side with engineers in practical design and production work. Additionally, some four-year institutions offer degrees in technology that make it possible for students to obtain positions categorized somewhere between "technician" and "engineer."

> Technicians bring varying levels of formal education and credentials to their work. Many enter technical fields with no more than a high school diploma and a splash of training acquired on the job. Since the smaller armed forces of today no longer turn out technicians in the numbers they did during the Cold War years, more aspiring technical workers are coming to these careers from a trade school or a community college. And an ever-increasing number of them have a four-year university education or advanced degrees . . . the number of college graduates who take jobs in technical fields will grow by 75% to 2.2 million over the next decade (Fortune, August 22, 1994).

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There are a wide variety of programs in existence for training engineers and engineering technicians. Engineering training programs vary considerably in title and content. Some two- and four-year schools have agreements whereby students complete their initial engineering study at the two-year school, and are automatically admitted to the four-year engineering program upon successful completion of those two years. Other schools have agreements for programs that allow students to attend two years at one school and three at another, yielding either two separate bachelor's degrees or a master's degree in engineering at the conclusion of the five years of study.

Entry-level engineers and engineering technicians typically begin by doing routine work under the supervision of experienced engineers. Some companies provide on-the-job training for entry-level engineering staff, allowing them to become familiar with the specific equipment and requirements of the position. Nearly eighty percent (77.8%) of employers contacted indicated that they offer tuition assistance and/or other incentives for personnel in computer aided design and engineering fields. Further, approximately three quarters (70.4%) of employers offer on-the-job training in CAD applications for their technical employees. Some employers noted that they provide in-house training because new and continuing employees alike are in need of job-specific training that is best obtained at the work site. Others indicate that the students need to be trained on the most up-to-date equipment and that equipment is not available at most colleges. Comments from employers contacted for the employer survey include:

> Chrysler conducts their own in house formal education plus they require time on the job where an instructor is available to help when needed. It takes about one year to school/train an employee before they are productive.

> The computer systems that students are trained on should be state-of-the-art equipment. If a student is trained on an obsolete computer system, once they start working, it takes at least 3-6 months to get them up to speed on systems corporations are now using.

We heard from many employers who suggested that the training offered at colleges and universities in computer aided design and engineering must do a better job of keeping abreast of the most current software packages used by major manufacturers, as those are the applications that the students will need to know in order to be most readily employed. Employers are interested in knowing that their future employees are able to understand and productively operate the specific applications used in their particular workplaces:

> Interface with Ford for Ford's needs. Make sure employees know the latest UNIX and different languages, for example, SUN language was just changed to SOLARIS.

> Provide training in Computer Graphics System (CGS) and Unigraphics language. Offer no CATIA or PRIME.

It appears that area employers are looking for personnel who are capable of not only operating the CAD systems, but who are also able to conduct analyses that have previously been considered the work of baccalaureate or master's degreed engineers. One employer states

> (I) suggest OCC does not duplicate Macomb program. Try to be different. Perhaps, best to concentrate on tool and die related or fixtures (not body). I believe OCC would have better results. I want OCC to demonstrate that their students are equal to -- or better than -- Macomb's but, so far,

that has not happened. OCC is putting out people who know how to make the computer do all the CAD functions, but do not know how to apply that to problems. They know the computer but do not have knowledge of the design side or design areas.

This employer's comment implies that more rigorous coursework for OCC students in design and analysis functions (such as those proposed in the CAE option) might increase their employability in the local area.

We also heard from some employers that the field of CAE is not one in which an associate's degree is adequate:

You can't turn out engineers from a two-year college. These people will work as modelers, assistants, etc.

This should not be incorporated into a 2-year degree unless you're developing an engineering technology degree.

When asked to indicate whether they believed there was a demand for students trained in computer aided engineering options in a community college, 93.2% of all employers indicated that they believed there was such a demand (See Table 5 and Figure 2).

Table 5

Is There a Demand For Students Trained in CAE Applications?

Employer Response	Number	Percent
Yes	68	93.2
No	2	2.7
Don't Know	3	4.1
Total Responding	73	100.0

Figure 2

Don't Know 4.1%

No 2.7%

Yes 93.2%
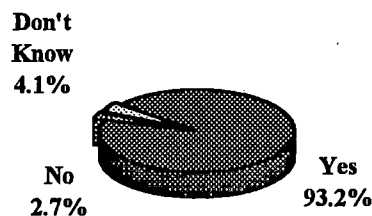
A large proportion of students (92.9%) also indicated that the proposed option in CAE was a good idea (See Table 6 and Figure 3).

Table 6

Is a CAD option in Computer Aided Engineering a Good Idea?

Student Response	Number	Percent
Yes	195	92.9
No	3	1.4
Don't Know	12	5.7
Total	210	100.0

Figure 3

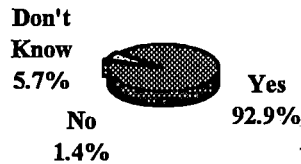Don't Know 5.7%

No 1.4%

Yes 92.9%

Information gathered in the Employer Survey conducted as a part of this study suggests some variation in attitudes among employers of CAD operators and CAE technicians. Many employers were concerned that the specific applications that might be taught in a Computer Aided Engineering option must be up-to-date and consistent with the applications used in industry:

> Whether OCC adds CAE should not be an option--should be considered a "must do, a certain." Make sure that it is a hands-on, state-of-the-art program. The program should work hand in hand with leaders in the industry--Chrysler, Ford, GM--people with foresight to guide OCC in real world applications.

> Can't find people who know the large variety of CAD systems we have. Lack industry knowledge. Most (new employees) have a good knowledge of software but don't know how it is applied.

> . . . GM should have an on-going dialogue with OCC to find areas where we can "fit" -- so far this hasn't happened. We should try to get together because we are in each other's back yards.

Several employers expressed concern that the current training offered at OCC was not tailored to meet their specific needs. Many employers suggested specific types of software that should be taught, and recommended additional skills that would make students desirable to hire.

> OCC hasn't been responsive to our needs. We'd love OCC to be a source for co-ops.

> There is a lot of focus on tools -- need more focus on applications (solving problems).

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OCC's program should be flexible enough to go along with the constantly changing technology. Perhaps, OCC could have quarterly classes to keep up with all the latest developments in the field.

Employers who were in favor of the development of a CAE option were also asked to suggest the need for training in various CAE applications within that option. The results of that inquiry appear in Table 7 and Figure 4.

Table 7

How Important are Various CAE Applications?

Application	Required	Elective	DoNot Offer
Solid Modeling	4.8%	38.7%	56.5%
Advanced Surfaces	3.2%	37.1%	59.7%
Finite Element Modeling	6.7%	38.3%	55.0%
Finite Element Analysis	6.7%	43.3%	50.0%
Kinematics	14.0%	59.6%	26.3%
Stereolithography	13.8%	77.6%	8.6%
Virtual Reality	21.0%	54.8%	24.2%
Numerically Controlled Tool Path Generatio	8.3%	45.0%	46.7%
Design for Assembly	1.6%	19.7%	78.7%

Figure 4
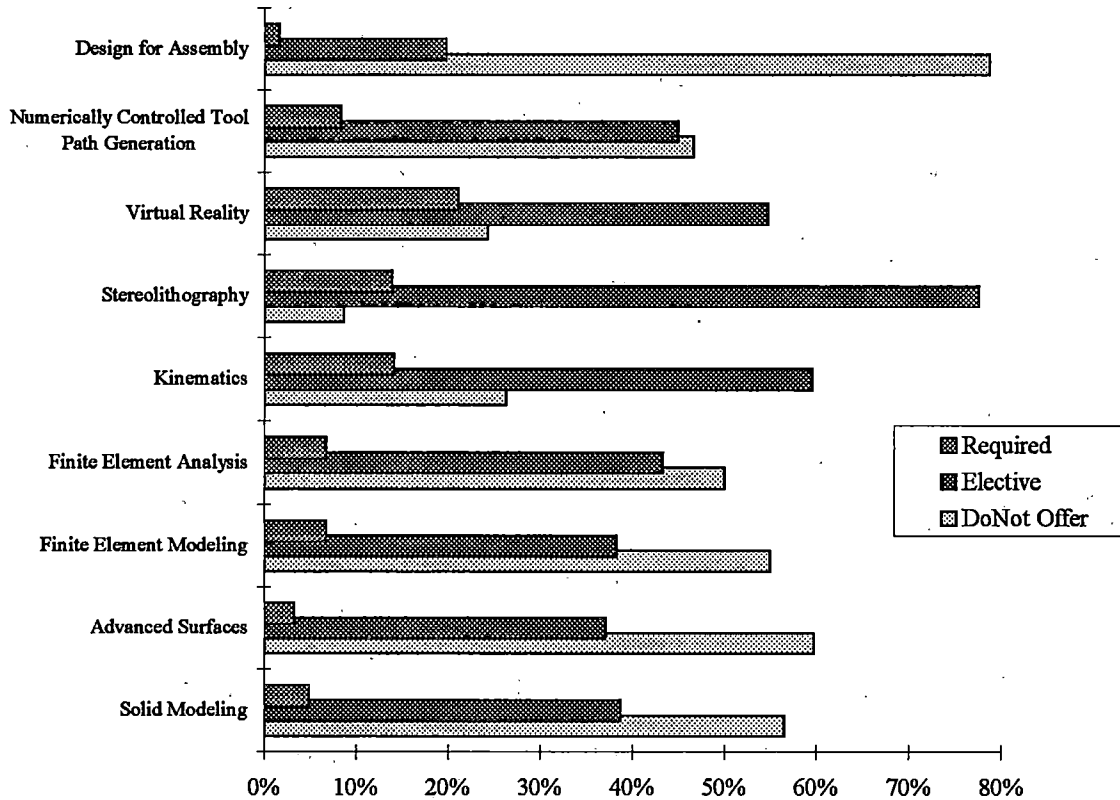
The findings show that employers do not agree on the types of coursework students in CAE should be taking as required courses and as electives. There is a greater amount of consistency regarding which courses are the least important ("do not offer" category). Design for assembly, Advanced Surfaces, Solid Modeling, Finite Element Modeling, and Finite Element Analysis were most frequently placed into the "do not offer" category. The greatest amount of support was shown for courses in Virtual Reality, Stereolithography, and Kinematics.

Employers were also asked their opinion of the importance of general education courses in a technician's training. The employer responses we received suggest that math and English are high on the list of general education skills new employees should bring to the workplace. Additionally, many employers indicated that good communication skills and the ability to work as a team member will make one potential employee stand out from the crowd: "All communication skills are important; reading, writing, speaking, and listening. . . "

Training Availability

Increasingly, community college technology programs are becoming providers for essential technological training for industry. *Crain's Detroit Business* (August 15, 1994) reports that OCC's technology programs' largest recent enrollment growth has come from employed workers who are needing additional technological training to remain current in their jobs. This sentiment is echoed in the Occupational Outlook Handbook (1994): "(those) whom employers consider not to have kept up may find themselves passed over for promotions and are particularly vulnerable to layoffs" (p. 76).

Several of the colleges in the State of Michigan offer technology courses in Computer Aided Design (CAD), although Computer Aided Engineering (CAE) applications appear to be part of the engineering curricula; and are taught only at the baccalaureate and higher levels. Several higher educational institutions in the State were contacted about their CAD and CAE programs. The information obtained from those college catalogs and conversation with college personnel from those institutions is summarized below.

> **Ferris State University:** Ferris offers an Associate's Degree in Mechanical Engineering Technology that is intended to prepare graduates for positions as technicians who work with engineers in the areas of machine and product design, quality control and research. Dean Ken Kuk predicts that future work in design and engineering will utilize computerized systems, although students trained in the analysis of those designs should be top priority. He stresses that a strong background in the fundamentals of engineering is an essential element of any student's training, and suggests that it may take more than 2 or 3 years to gain all the necessary skills. He does, however, suggest that today's workplace is one of teamwork and collaboration, and persons with all levels of engineering knowledge are sought by employers.

> **Henry Ford Community College:** Henry Ford offers two specific courses in CAD (Computer Aided Drafting), although the college does not offer a program designation in CAD. The program's growth is limited by room size currently, although there is currently an addition being added to the laboratory. The program does not offer any coursework in computer aided engineering, although some students in the program go on to complete engineering degrees via 2+2 programs at Lawrence Tech, Eastern Michigan University and Wayne State University.

Lawrence Technological University: Lawrence Tech does not offer an associate's degree in CAD, but does offer an associate of science degree in Mechanical Engineering Technology and many bachelors and master's program options in engineering specializations. Students who enroll in the Mechanical Engineering Technology program are trained in both theoretical and practical aspects of mechanical design, development, manufacturing, and engineering, and receive training in CAD applications. Graduates typically accept positions in areas such as drafting, research and development, computer aided design, or manufacturing processes.

Macomb Community College: Macomb offers an Associate's Degree in Drafting and Design that incorporates some computer drafting. The program is focused on drafting techniques in two-and three dimensions. The program is geared heavily toward automotive work, and is also known as Vehicle Design. The program is designed to allow students to receive an Associate of Applied Science Degree in one of three different options. All three options involve a co-op experience and may allow a student to receive an MCC Design Certificate. The first option is intended for students who are interested in becoming detail draftsmen, layout personnel or product designers. The second option can be used to transfer into a Bachelor of Science in Engineering Technology degree in Product Design from Wayne State or Ferris State University, or may lead to a Bachelor of Science degree in Technology from Lawrence Tech. The third option allows students to use some of their coursework toward a Bachelor of Science in Mechanical engineering from Wayne State or Lawrence Tech. .

Michigan Technological University: Michigan Tech offers an Associate's Degree in Mechanical Engineering that can lead to a four year engineering degree. The courses offered for the associate's degree include English, math, introduction to computers, drafting, and geometry. After completion of those basic courses, students will be involved in computer drafting, materials, machine shop, AUTOCAD, mechanical measuring principles, electronics (for electronics majors), statics and manufacturing processes/materials courses. All associate's degree candidates must complete one year of physics. Timothy Collins, Chair of the Technology Department, indicates that graduates of the Associate's Degree program are vying for the same positions as engineers, and that their skills are highly valued by employers in manufacturing fields.

Washtenaw Community College: Washtenaw offers Computer Aided Drafting (CAD) courses with two options: Electronic or Mechanical. The college also offers a certificate in Drafting Detailing and an associate's degree in Industrial Drafting Technology. The Wasthenaw programs are geared toward the drafting aspects of computer technology, and graduates typically obtain positions as CAD operators or technicians.

Student Survey Results

The majority of students surveyed as a part of this study were employed, with over three-quarters (76.2%) of the CAD students surveyed being employed full-time, and another 9% employed part-time (Table 8 and Figure 5).

One student expressed concern that the instruction was geared only toward students who are experienced in CAD and already working in the field: ". . . some instructors assume most of the students are already working in the field, so they don't take out the time to be thorough but skip information that beginning students might find helpful."

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Table 8

Employment Situation of Surveyed CAD Students

Employment Situation	Number Responding	Percent of Total
Full-Time Employment	160	76.2%
Part-Time Employment	19	9.0%
Unemployed, Seeking Work	23	11%
Unemployed, Not Seeking Work	8	3.8%
Total	210	100.0%

Figure 5
Employment Situation of CAD Students
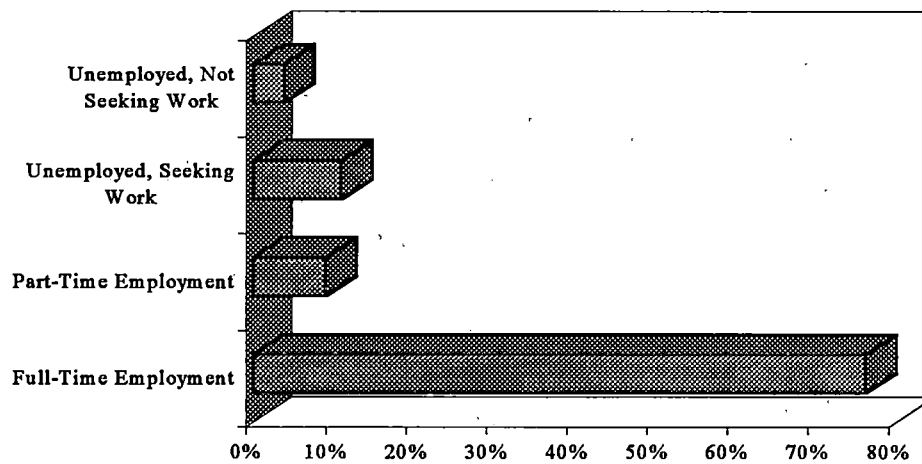
Of those students who indicated they were either part- or full-time employed, 12.5% indicated that their jobs were considered an co-op or internship. There are significant differences between men and women with regard to employment status. Men are more likely to be employed full-time, while women are more likely to be employed part-time. Men and women are equally likely to be unemployed but not seeking employment. Of those who are unemployed and currently seeking employment, three quarters (75%) are men, and one quarter (25%) are women (See Figure 6).

Figure 7
Gender Differences in Employment
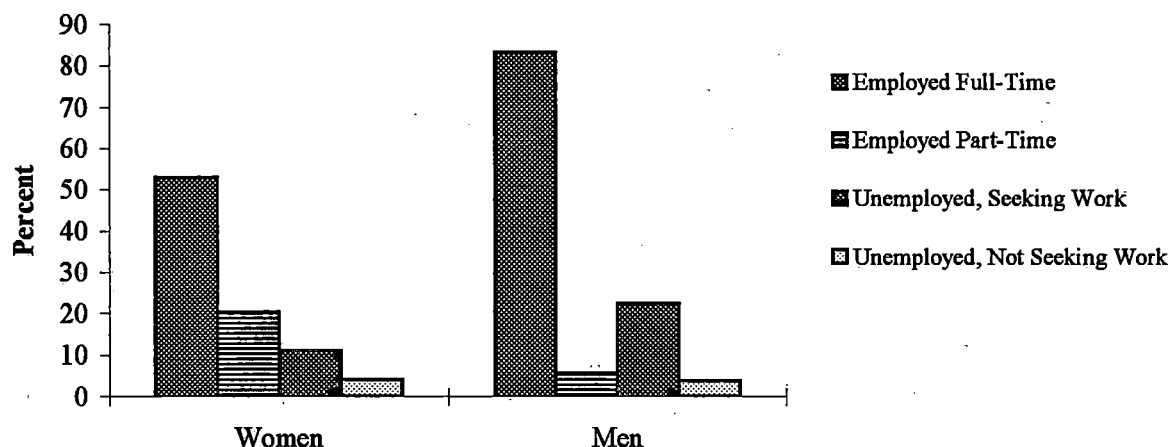
Gender Composition in Existing CAD Program

Of the students contacted for the student survey, nearly one quarter were women. The women involved in the program do not appear to differ significantly from their male counterparts in their career or educational aspirations. As mentioned earlier, the women in the program tend to be employed *part-time* in greater proportions than the men. Women are also slightly less likely to rate their employment as being related to their CAD instruction at OCC. There are no differences between men and women in the extent to which they think a CAE option would be a good idea, nor whether or not they might enroll in such an option if it were offered.

Reasons for Taking CAD Courses at OCC

Ninety percent of the students who were either full- or part-time employed indicated that they are taking CAD courses in order to get a raise, while ninety five percent indicated that they were taking CAD courses at OCC in order to gain skills needed for their current jobs. Expectedly, persons whose employment was highly related to CAD were most likely to report taking courses for career related reasons (skill development, employer request or to get a raise).

The employed students (both full- and part-time) were asked to indicate the extent to which their current employment is related to their OCC CAD instruction. Sixty-two percent of students surveyed indicated that their jobs were somewhat or highly related to their CAD instruction at OCC. Of those students in related jobs, 52.6% indicated that OCC offered all the CAD instruction that they needed to do their jobs, while 47.4% indicated that their jobs required CAD instruction that is not currently offered at OCC. More than half of those in related positions (52.8%) indicated that they would enroll in the new CAE option, if it were offered. Over half of both men and women involved in the CAD program (52.3% of men and 52.3% of women)

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indicated that they would definitely consider enrolling in a CAD option in Computer Aided Engineering if such an option were offered at OCC (See Figure 7).

Figure 7

Would You Enroll in a CAE Option?

Don't
Know
5%

No
5%

Would
Definitely
Consider
52%

Might
Consider
38%
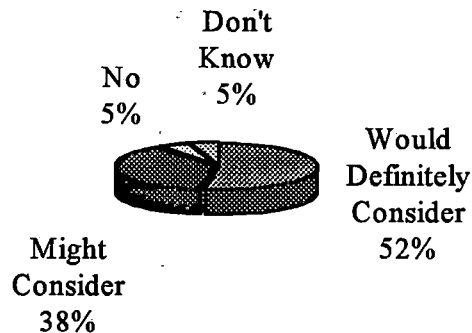
Several students commented on the current CAD curriculum; specifically, the extent to which the curricular offerings at OCC support their employment skill needs:

AUTOCAD is not required for my *degree*, but my *job* requires that I learn AUTOCAD.

(OCC needs to offer) Pro-Engineer & also a variety of systems that are used in the Big 3.

Software is ancient, needs to be updated.

OCC should offer more current up-to-date technology, the auto industry (is) into PRIME and CATIA. Too many courses are integrated, such as CADAM.

I didn't get involved with the co-op program, but I think it should be mandatory for graduation. Students should have to take a course that's structured exactly like the workplace, so they know what they are getting into.

(I) learned more from interacting with other students than from professors, (the instructors) give information but cannot teach, and (the program should be) more diversified outside of the automobile industry.

The most consistent comments had to do with the lack of availability of lab time, the scheduling of that time, and the fact that students are required to share computer hardware in classes. Typical comments from those students included:

More computer lab time needed, assistance in the lab, teacher assistance, and students have to fend for themselves to get information.

The hardware/student ratio must be good. If there is not enough equipment CAD option will not be successful.

More lab hours, lab hours needed for students working during the day, therefore more evening hours needed.

. . . there is not enough lab time. Lab is poorly run, OCC should install more tubes and get more personnel to provide better supervision over the lab.

Lab hours are crazy. Two people to a computer is not fair.

No longer with the program. Dropped classes because of the lab hours.

Not enough lab time for people who work days.

Class sizes are overwhelming, and it is hard to get lab time. Make the size of classes smaller for the new option and provide additional lab time.

Part- time teachers don't know how to teach. Not enough lab time; overcrowded with two students to a computer. A lot of money spent, but being short-changed on education. They care more about money than the education of the student.

OCC doesn't have enough computers, not enough lab time, not enough classes. If OCC offers a new program these problems need to be corrected.

Not enough lab time allotted, which hinders the students from learning at their full potentials. Need to expand lab times to help people who work, and open labs are extremely crowded because there are not enough computers.

Over three-quarters of employed students are taking CAD courses in order to comply with their employer's requests. Student responses regarding their "major" reason(s) for taking CAD courses at OCC appear in Figure 8 (multiple responses were allowed).

Figure 9
Why Did You Enroll in CAD Courses at OCC?
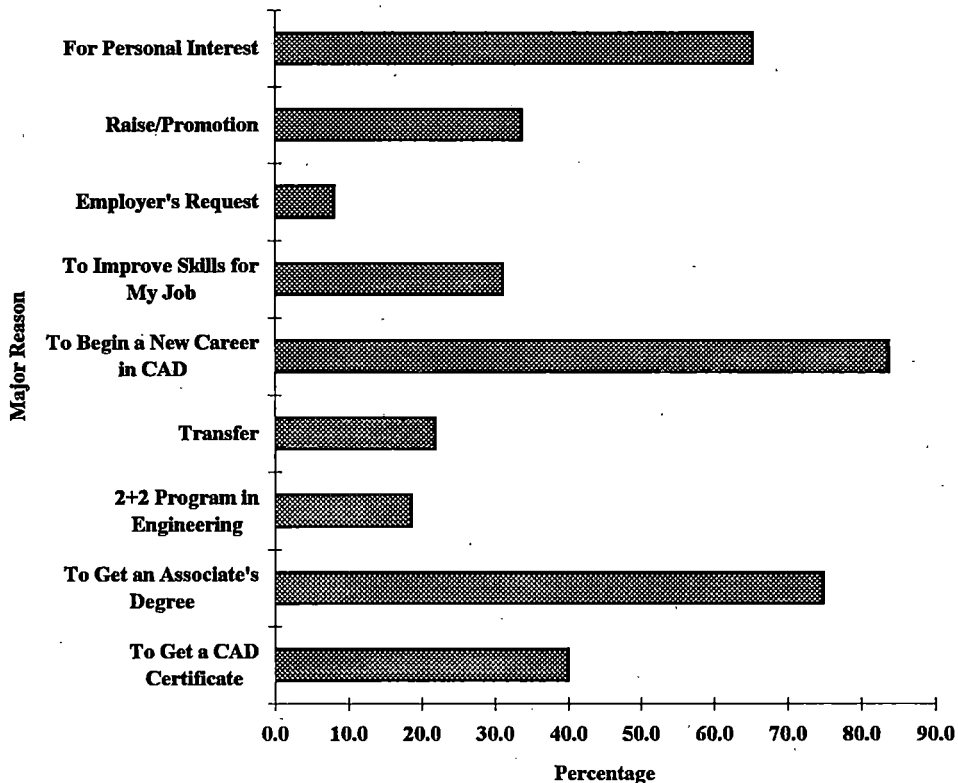
Recent CAD students contacted for the Student Survey are fairly evenly split with regard to whether or not the current CAD program offers all the CAD training they need. Fifty two percent of respondents say that OCC offers enough CAD instruction currently, while 48% believe there is a need for additional training opportunities.

Student comments were largely focused on the current CAD program, suggesting that the technical courses proposed for the Computer Aided Engineering (CAE) option may be unclear to them. However, there were a number of students who provided comments regarding the proposed option. Specific student comments regarding a CAE option within the CAD program at OCC included:

> If option includes all the elements mentioned, it would be a good program. Take a group of people from industry, to put the program together.

> (I) strongly recommend adding the offering, in addition to CAM courses. CAM takes CAD one step further, and CAE takes CAM one step further. Also suggest adding more open lab time, more real world examples of CAD should be done in class with more up-to-date projects, more AUTOCAD classes.

> In the long run (OCC) has no choice but to keep up with today's technology and to keep it current . . .

Orient (the CAD program) more toward engineering than design, or let students know that it is design-oriented.

If it's not a 4-year degree it's a waste of time. OCC needs an electronics CAD degree (2-year), and more AUTOCAD.

Virtual reality, Unigraphics (solids), and kinematics are interesting to me. I would take classes in these subjects.

CAE option, great idea. Students need more experience on the board as compared to the computer, which is now the case. This will give them a better understanding.

Kinematics and solid modeling definitely the way to go for the future. CAE would be more useful to more people than auto body program.

The CAE option should have been considered a long time ago. It is a good idea and it would have helped many graduates from the program, like myself.

The (CAD) program was excellent as far as I'm concerned. I believe the CAE option will be of even greater benefit to students.

OCC has a good program. I think the CAE option is definitely along the lines that the industry is moving.

CONCLUSION

Local CAD employers and current OCC CAD students are shown to support the creation of a CAD program option that will incorporate Computer Aided Engineering applications. Employers and students alike tend to favor curricular planning for what appears to be an increasingly competitive and computerized work environment.

The proposed option in CAE will present minimal cost to the College for start-up, although it is important for the College to plan for hardware and software upgrades in order to maintain a competitive edge in the employment market. Enrollments in the CAD program have been strong during the past ten years, with the program seeing nearly a two-fold increase in both student credit hours and student headcount over that period. This enrollment trend appears to be a mixed blessing, providing stability and strength for the program, while presenting obstacles regarding the lack of adequate laboratory space and equipment.

Employers have suggested that the new program would be well-advised to consider interfacing closely with local employers regarding the software packages and applications that are taught in the new program. Nearly three quarters of polled employers offer in-house training for their CAD employees, and a similar number provide tuition assistance for employees to receive training off-site. A careful integration of employer needs into the OCC CAE program option might tempt employers to send their employees to OCC for training in greater numbers than they currently do.

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A Computer Aided Engineering option in the OCC CAD program would be unique among associate's degree programs in the State of Michigan. Many community colleges in the State of Michigan offer drafting and design courses that incorporate computer aided design and drafting techniques, while the universities typically offer four-year and advanced engineering degrees that incorporate the Computer Aided Engineering courses. The proposed Computer Aided Engineering option would include courses in solid modeling, advanced surfaces, finite element modeling, finite element analysis, kinematics, stereolithography, virtual reality, numerically controlled tool path generation, and design for assembly that are currently taught almost exclusively at the university level. There is no indication that other institutions currently offer extensive associate-level course offerings in Computer Aided Engineering. Of the students polled for this needs assessment, 52% indicated that they would definitely consider enrolling in the option, and another 38% said they might consider enrolling. Only 5% of students surveyed would not consider the option.

This analysis suggests that there is strong student and employer support for the creation of an option in Computer Aided Engineering (CAE) within the Computer Aided Design (CAD) program at OCC. Concerns expressed by students included the need for additional laboratory equipment and hours, and that the subjects taught be relevant to the workplace. Employers expressed considerable support for the option as well, and suggest that linkages between OCC and industry leaders will assure that OCC remain on the cutting edge of training for local industry.

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APPENDIX A

CAD/CAE
Employer Survey

1. We at OCC are considering developing a new curriculum within our Computer Aided Design (CAD) program that would focus specifically on Computer Aided Engineering (CAE). Your input regarding whether or not this is a viable option is valuable to us as we make this decision. Would you be willing to assist us by answering some basic questions about Computer Aided Design and the Computer Aided Engineering field and how your company utilizes those technologies?

   1 _____ Yes
   0 _____ No *(Thank them for their time and discontinue survey)*

2. Does your organization have people on staff who work in Computer Aided Design?

   1 _____ Yes
   0 _____ No *(Thank them for their time and discontinue survey)*
   7 _____ *Don't Know (Ask them if there is someone else at the organization who might know... If not, thank them for their time and discontinue survey)*
   9 _____ *No response (Thank them for their time and discontinue survey)*

3. Are you familiar with OCC's program in CAD?

   1 _____ Yes
   0 _____ No
   7 _____ *Don't Know*
   9 _____ *No Response*

4. Does your company ever hire personnel with technical skills in Computer Aided Engineering (CAE) applications such as solid modeling, kinematics, finite element modeling, finite element analysis, advanced surfaces, stereolithography, virtual reality, numerically controlled tool path generation, or design for assembly?

   1 _____ Yes *(Skip to 6)*
   0 _____ No
   7 _____ *Don't Know (Skip to 11)*
   9 _____ *No Response (Skip to 11)*

5. Do you think your company may begin to use any of these technical applications in the near future? Please explain.

      1 _____ Yes, Please Explain: *(Complete Narrative below, Skip to 11)*
      0 _____ No, Please Explain: *(Complete Narrative below, thank them for their time,*
                                    and end survey)
      7 _____ *Don't Know (Complete Narrative below, Skip to 11)*
      9 _____ *No Response (Skip to 11)*

_____

_____

_____

_____

6. Is your company currently hiring persons with any of these technical skills?

      1 _____ Yes
      0 _____ No *(Skip to 11)*
      7 _____ *Don't Know (Skip to 11)*
      9 _____ *No Response (Skip to 11)*

7. What is the **PRIMARY** reason for hiring these employees?

    1 _____ Expansion of the company
    2 _____ Employee turnover
    3 _____ Need people trained in new technologies
    7 _____ *Don't Know*
    9 _____ *No Response*
    4 _____ Other reasons. Please specify:

_____

8. Do you experience any difficulty finding entry level personnel with technical skills in Computer Aided Engineering applications such as those I mentioned before? *(You may review the list with them if necessary: **solid modeling, kinematics, finite element modeling, finite element analysis, advanced surfaces, stereolithography, virtual reality, numerically controlled tool path generation, or design for assembly**).*

1 _____ Yes
0 _____ No *(Skip to 10)*
7 _____ Don't Know *(Skip to 10)*
9 _____ No Response *(Skip to 10)*

9. What types of problems do you encounter when you are looking for qualified CAE trained employees?

_____

_____

_____

10. What is the **MINIMUM** education a person must have before he/she is qualified to be hired to work with computer aided engineering applications in your company? *(Check all that apply)*

	Yes	No
a) No specific educational requirement	_____	_____
b) High School or equivalent	_____	_____
c) Completion of Apprenticeship/Co-op	_____	_____
d) Certificate in CAD	_____	_____
e) Associate's degree	_____	_____
h) Bachelor's degree	_____	_____
i) Master's degree or higher	_____	_____
j) Other type of education *(Specify:)*	_____	_____

_____

11. Do you perceive that there is a demand for workers who have technical skills in CAE applications?

1 _____ Yes
0 _____ No *(Skip to 14)*
7 _____ Don't Know *(Skip to 14)*
9 _____ No Response *(Skip to 14)*

12. I will now read a list of technical areas in which Computer Aided Engineering courses might be developed. Would you please rate the level of importance they should have in a community college Computer Aided Engineering program? Please use a three point scale: **"Must be a Required Course"**; **"Offer as an Elective, (But don't Require)"**; or **"Do Not Offer."**

		Required Course	Offer as Elective Course	Do Not Offer
a.	Solid Modeling	3	2	1
b.	Advanced Surfaces	3	2	1
c.	Finite Element Modeling	3	2	1
d.	Finite Element Analysis	3	2	1
e.	Kinematics	3	2	1
f.	Stereolithography	3	2	1
g.	Virtual Reality	3	2	1
h.	Numerical Controlled Tool Path Generation	3	2	1
i.	Design for Assembly	3	2	1

13. Are there other **technical skills** you think we should include in our Computer Aided Engineering curriculum?

_____

_____

14. At OCC, all students enrolled in degree programs must complete a group of general education courses in fields such as English, math, writing and social science. Are there **basic educational skills** you look for in new employees? Please specify:

_____

_____

15. How would you categorize your company type? *(You may read them the choices, but check ONLY ONE)*

1 _____ Non-Automotive Engineering firm
2 _____ Automotive Engineering
3 _____ Original Equipment Manufacturer (OEM)
4 _____ Design and Analysis Firm
5 _____ Job Shop (Contract work for industries)
6 _____ Other, please specify:

16. What is the starting salary range for **ENTRY LEVEL** personnel in your organization who are trained in Computer Aided Design (CAD)?

Entry Level Salary Range

$ _____ to $ _____ per hour

_____

17.   If one of your current CAD employees received training at a community college in technical applications of computer aided engineering, how might that training affect their earnings?

        1 _____ No change in income
        2 _____ Small increase in income
        3 _____ Substantial increase in income
        7 _____ *Don't Know*
        9 _____ *No response*

18.   Do you provide tuition assistance (or other incentives) for your current employees to improve their technological knowledge and skills?

        1 _____ Yes
        0 _____ No

19.   Does your company provide any on-the-job training in computer aided engineering?

        1 _____ Yes
        0 _____ No *(Skip to 21)*

20.   Would you explain what types of on-the-job training your company offers to your employees?

        _____

        _____

21.   OCC offers specially designed training and education programs for individuals and groups. Does your company have training or education needs that might be met in this way?

        0 _____ No
        7 _____ Uncertain
        1 _____ Yes, Please explain:

        _____

22.   Would you be interested in assisting OCC in the design and development of the CAE option? *(This could include activities such as focus groups, advisory committees...)*

        0 _____ No
        1 _____ Yes

23.   Is there anything else you might want to share with us as we consider whether or not to design a Computer Aided Engineering Program at OCC?

        _____

        _____

APPENDIX B

EMPLOYERS CONTACTED

Acro Engineering Incorporated
17187 Laurel Park Drive, Ste 165
Livonia, MI 48152

Advance Laser Applications, Inc.
47808 Galleon Dr.
Plymouth, MI 48170

Antares Engineering, Inc.
31651 Research Park Drive
Madison Heights, MI 48071

Applied Instruments Co.
51760 Grand River
Wixom, MI 48393

APX International
1100 E. Mandalin
Madison Heights, MI 48071

Arrowsmith Tool and Die
23811 Telegraph
Southfield, MI 48034

Automotive Products Inc.
4000 Pinnacle
Auburn Hills, MI 48326

Bartech Incorporated
555 Horace Brown
Madison Heights, MI 48071

Brothers Industries
32471 Industrial Dr.
Madison Heights, MI 48071

Budd Company
2573 S. Rochester Road
Rochester, MI 48063

CAD/CAM Corporation
23065 Commerce Drive
Farmington Hills, MI 48335

CAE Technology
38701 W. 7 mile rd., Suite 465
Livonia, MI 48152

Cargill Detroit Corp.
1250 Crooks
Clawson, MI 48017

CDI Corporation
28000 Dequindre
Warren, MI 48092

Chrysler Corporation
800 Chrysler Drive W.
Auburn Hills, MI 48057

Chrysler
22460 LaVon
St. Clair, MI 48081-2033

Chysler Corporation
800 Chrysler Drive
Auburn Hills, MI 48057

Chysler Corporation
800 Chrysler Drive E.
Auburn Hills, MI 48326-2757

Classic Design
665 Elmwood
Troy, MI 48083

CMI Technology Center
1600 W. 8 mile Road
Ferndale, MI 48220

Commerce Industries
4270 Haggerty Road
Walled Lake, MI 48390

Computervision
3 Parklane Blvd., Suite 923 W.
Dearborn, MI 48126-2502

Contact Professional, Inc.
4141 W. Walton Blvd.
Waterford, MI 48329

Contact Professional, Inc.
5601 Highland Road
Waterford, MI 48329

Contract People Corporation
17000 W. 10 mile road, suite 107
Southfield, Mi 48075

Control Power Reliance
1955 Stephenson Highway
Troy, MI 48083

Creative Industries Group
275 Rex Blvd.
Auburn Hills, MI 48326

D M E Company
29111 Stephenson Hwy.
Madison Heights, MI 48071

Electrical Design & Control
2545 Industrial Road
Troy, MI 48084

Engineering Technology, Ltd.
777 Chicago Road
Troy, MI 48083

Engineering and Analysis
27800 Dequindre
Warren, MI 48091

Federal Mogul Wrld Hdqrtrs.
26555 Northwestern Hwy.
Southfield, MI 48034

Ford Motor
21500 Oakwood Blvd.
Dearborn, MI 48121

Ford Motor Company
Village Plaza, Suite 100
Dearborn, MI 48124

G. M. Truck and Bus Group
32505 Industrial Drive
Madison Heights, MI 48071

General Dynamics Land Systems
295 Kirts Blvd
Troy, MI 48084

General Dynamics
38500 Mound Road
Warren, MI 48090

GM Design Center
30100 Mound Road
Warren, MI 48090-9030

GM Truck and Bus
32505 Industrial Drive
Madison Heights, MI 48071

Great Lakes Technology -GM
4100 S. Saginaw
Flint, MI 48557-6103

Harley, Ellington, Pierce & Yee
26913 Northwestern Highway
Southfield, MI 48034

Hollowell Engineering
16030 Michigan Avenue
Dearborn, MI 48126

International Partnership Group
900 Wilshire, Ste 115
Troy, MI 48084

K-R Automation Corp.
2000 Centerwood Drive
Warren, MI 48091

Kenneth Neumann/Joel Smith &
Associates
400 Galaria Office Center
Southfield, MI 48034

Kent-Moore Division of SPX
28635 Mound Road
Warren, MI 48092

Masco - Forming Technology
2727 W. 14 mile rd.
Royal Oak, MI 48073

McKenna Industries
2222 Stephenson Highway
Troy, MI 48084

MegaTech Engineering Co.
1950 Concept Drive
Warren, MI 48091

Milford Fabricating
19200 Glendale
Detroit, MI 48223

Minoru Yamasaki Associates
6841 N. Rochester Rd., Ste 300
Rochester Hills, MI 48306

Modern Engineering
4400 S. Saginaw #1200
Flint, MI 48507-2664

Modern Engineering Services
28000 Dequindre
Warren, MI 48092

Modern Engineering
28000 Dequindre
Warren, MI 48092

Mylar 2 Mold, Inc.
1091 Centre Road, #29
Auburn Hills, MI 48326

Nissan R & D
P. O. Box 9200
Farmington Hills, MI 48333

P G F Industries
2891 Industrial Row
Troy, MI 48084

Peak Technical Inc.
400 W. Maple, Ste 300
Birmingham, MI 48011

Peak Technical Inc.
2580 Industrial Row
Troy, MI 48084

Preferred Personnel
2690 Crooks Road, Suite 107
Troy, MI 48084

Product Development Center
1708 Northwood
Troy, MI 48084

Saturn Corporation
1420 Stephenson Hwy.
Troy, MI 48007

Starr Cutter Company
23461 Industrial Park
Farmington Hills, MI 48335

Stegner East Controls
33946 Doreka
Frasier, MI 48026-1611

Supervision Engineering Services
1400 S. Livernois, P.O. Box 5020

Rochester Hills, MI 4830

Tanury
1795 Maplelawn
Troy, MI 48084

Technical Placement Services
P.O. Box 454
Southfield, MI 480375

The A Team, Inc.
P. O. Box 368
Drayton Plains, MI 48330-0368

Thomas Design
1475 S. Washington
Saginaw, MI 48601

TMP Associates, Inc.
1191 W. Square Lake Road
Bloomfield Hills, MI 48303

Triad Services Group
570 Executive Drive
Troy, MI 48083

Troy Design
5500 Enterprise
Warren, MI 48093

Uniflow
46039 Grand River
Novi, MI 48374

United Indl. Engrg. Corp.
1934 Hiede
Troy, MI 48084

Warrick Controls
4237 Normandy Ct.
Royal Oak, MI 48073

Webasto North American
Engineers
2700 Product Drive
Rochester Hills, MI 48309

Woodridge INOAC, Inc.
2500 Meijer Drive
Troy, MI 48084

Yale Tool
1471 Goldsmith
Plymouth, MI 48170

APPENDIX C

CAE Option; *CAD PROGRAM*
STUDENT SURVEY

*Student's Name:*_____

*Student's Social Security Number:*_____

1. I am going to read you a list of reasons students enroll in Computer Aided Design Courses at OCC. Please tell me if the following statements represent a Major Reason, Minor Reason, or Not a Reason for your enrolling in CAD courses at OCC:

	Major Reason	Minor Reason	Not A Reason	No Response
a. To obtain a certificate in CAD	3	2	1	9
b. To obtain an associate's degree	3	2	1	9
c. To enter a "2+2" program in engineering	3	2	1	9
d. To complete courses necessary for transfer	3	2	1	9
e. To prepare for a career in CAD	3	2	1	9
f. To improve skills needed for your present job	3	2	1	9
g. To comply with employer's request	3	2	1	9
h. To improve chances for a raise or promotion	3	2	1	9
i. For personal interest	3	2	1	9

j. Other (Please specify) _____

2. What is/was your major program of study at OCC?

CAD _____ (Computer Aided Design)
CIM _____ (Computer Integrated Manufacturing Technology)
DDT _____ (Drafting and Design Technology)
MEC _____ (Mechanical Design Technology)
ROB _____ (Robotics/Automated Systems Technology)
ARC _____ (Architectural Technology)
EGR _____ (Pre-Engineering)
ATM _____ (Machine Tool Technology)
ADT _____ (Automobile Drawing)
APD _____ (Apprentice Drafting)
Other_____ (Please Specify)_____

3. Are you currently employed, or are you <u>not</u> currently in the work force?
If employed ask -> Is your employment full-time or part-time work?
If unemployed ask -> Are you actively seeking employment or are you not looking for a job at this time?

1 _____ Full-Time (employed)
2 _____ Part-Time (employed)
3 _____ Unemployed (actively seeking) *(skip to question 10)_*
4 _____ Unemployed (not seeking work *(skip to question 10)*
9 _____ No response

4. Is your employment considered a co-op or internship?

1 _____ Yes
0 _____ No
7 _____ *Don't Know*
9 _____ *No Response*

5. What is your current job title? *(Be specific)*

_____

6. On a scale from one to ten, with ten being "highly related" and one being "not at all related", to what extent is your current employment related to the coursework you have taken in CAD courses at OCC?   *(if 4 or lower, skip to 10)*

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*

Not at
all related

Highly
Related

7. What is the design application you most frequently work with? *(e.g. body design, power train design)*

_____

8. Have you found that your current job has required specific CAD skills or knowledge that OCC does not offer, or does OCC offer all the CAD instruction you have needed for your job?

1 _____ Yes, my job requires some CAD instruction that OCC doesn't offer
0 _____ No, OCC offers all the CAD instruction I need *(Skip to 10)*
9 _____ *No response*

9. What additional training/knowledge would be helpful to you in doing your job?

_____

10. In addition to the current CAD offerings, OCC is considering the creation of an option in the CAD program dedicated to Computer Aided Engineering. This new option would provide training in kinematics, solid modeling, advanced surfaces, finite element analysis (advanced analysis), design for assembly, finite element modeling, and possibly would include courses in virtual reality and stereo-lithography. Given what you know about the field of CAD, do you think an option in Computer Aided Engineering is a good idea or not?

1 _____ Good idea
0 _____ Not a good idea *(Skip to 12)*
7 _____ *Don't know (Skip to 12)*

11.   If the Computer Aided Engineering option was available within OCC's CAD program, would you Definitely Consider, Might Consider, or Would Not Consider enrolling in the option?

        3 ____ Would definitely consider
        2 ____ Might consider
        1 ____ Would not consider
        7 ____ *Don't know*
        9 ____ *No Response*

12.   Are there any other comments you would like to make about your experience in CAD courses at OCC? Specifically, do you have any comments that might be helpful to us as we consider whether or not to offer a Computer Aided Engineering option in the CAD program?

        _____

        _____

        _____

"Thank you very much for your time and assistance. We sincerely appreciate your help."

Interviewer Signature: _____ *Date :* _____

APPENDIX D

Student Narrative Responses

What is your current job title? (Be specific)

002. Sr. Dye Designer, Processor Layout Checker.
003. Project Leader (Computer Engineering)
004. Production Manager (Electronics)
005. Designer (Automotive)
006. Metal Model Maker.
007. Sales Electronics
009. Analyst (Engineer)
010. Project Coordinator, Rapid Proto Type
011. Engineer (Sound)
012. Senior Product Engineer, automotive industry.
013. Machinist
014. Technical assistant, fixture and gauge building.
015. Manager for a movie theater.
016. Regional director of engineering for Marroitt Hotels.
017. Computer Draftsman.
018. Sheet metal, mock up technician.
019. machinist
020. CAD\CAM technician
021. Layout Designer.
022. Machinist
023. Assistant Manager for Kiddlewinks.
025. Designer Level I
026. CAD Designer
027. Technical Support Systems
028. Detailer
030. Designer
031. CNC program setup operator
033. Draftsman
034. Supervisor
035. Designer
037. Waitress
038. Production
039. Continuous design/auto body
040. Automotive Designer
041. Bartender
042. Machine Tool Designer
043. Manual Drafting
044. CAD Designer
045. House Cleaner
046. Development Engineer
047. Draftsman/Detailer
048. Machinist
049. Technical Analyst
050. Assembler
051. CAD Operator / Designer
052. Stockroom Coordinator
053. Metal Model Maker
054. Payroll specialist
055. Shipping and Receiving (Design Prototype parts)
056. Co-op Jr. Designer Electrical
057. Design Instructor (Design current unigraph system)
058. Supervisor (Business)
059. CAD Operator
060. Detailer (Machine Tool)
061. Warehouse Manager
063. Technical Assistant
064. System Administrator/ CAD Designer
065. Junior Engineer
066. Designer - Computer Aided
067. Designer
068. Program Technician
069. Group Leader
070. Product Designer
071. Draftsman
072. Electrician
074. Engineer
075. Detailer
077. Dispatch Manager
078. Finite Element Analyst
079. Manual CAD Designer
081. Senior Tooling Designer
082. CAD Operator
083. Draftsman
084. Robot Assembler
085. Product Design
089. Meat Cutter
090. Designer
091. Company Treasurer, Blue Water Food Center
092. Detailer
093. Tooling Engineering
094. Design
095. Project Engineer / Design
096. Landscaping, lawn service
097. Detailer (auto parts)
098. Carbide Tool Maker
099. CAD Operator
100. Wood Model Maker
101. Engineering Analyst
102. Layout person / p / Detailing weld fixtures
103. Layout person (designer)/p/parts auto body design
104. Sales Administration (Insurance)
105. Designer/p/rubber seals
107. Quality Manager - Machine Company
108. Assistant Account Executive
109. Machine Set Up

110.	Electrical Detailer		179.	Self employed die designer
111.	Professional Land Surveyor		180.	Market Research.
112.	Designer		181.	Computer Operator
113.	Draftsman		183.	Draftsman
116.	Electrician / Fabricator		184.	Detailer
117.	Designer		185.	Designer
118.	Mechanics		187.	Detailer
120.	Systems Analyst		188.	Technical Illustrator
123.	CAD Detailer (light layout)		189.	Detailer
124.	CAD Operator		191.	Die Design
126.	Detailer		192.	Computer operator (Engineer)
127.	CAD operator		193.	CAD Designer
128.	Detail - Designer		194.	Tool Design and Layout
130.	Mail Clerk		196.	Tool machine maker, prototype
131.	Sales		197.	Product Engineer
132.	Detail/Designer		199.	CAD designer
133.	Clay Sculptor		200.	Draftsman
134.	Waitress		201.	Order tooling
136.	Fabrication and Design		202.	Designer
137.	Design		203.	Shop worker, design robotic arms
138.	CAD operator		204.	Designer, plastics
141.	Run Blue Prints		205.	Medical biller
142.	Designer (GM Power Train)		206.	Machinist
143.	Engineer Clerk (draw blue prints)		207.	Designer
145.	Drafting Dept. AH Campus (work study)		208.	CNC operator
147.	Designer		209.	Design Engineer
148.	Design Engineer		210.	Tool maker
149.	Retail Sales		211.	Assembler
150.	Facilities in telecommunications		212.	Engineer
151.	Auto CAD Detailer			
153.	CAD Detailer			
154.	Design			
155.	Photo Design Tech.			
156.	Metal model maker			
157.	Housekeeper			
158.	Mechanic			
159.	Designer			
161.	Color sprayer			
162.	Detailer			
163.	Maintenance			
164.	Senior Layout			
165.	Tool Designer			
166.	Designer			
167.	Senior designer			
168.	CAD Applications Specialist			
169.	Security Guard			
171.	CAD Technician			
172.	Personal Trainer			
173.	Housekeeper			
174.	Sales			
175.	Inventory Assistant			
176.	CAD designer			
177.	Self -employed in a field not related to CAD			
178.	Lab Assistant(work study program at OCC)			

What is the design application you most frequently work with? (e.g. body design, power train design)

002.	Dye Design		090.	Product Design
005.	Body Design		092.	Machine Tool
009.	Body & Power Design		093.	Auto CAD 12
010.	Cross Platform		094.	Trim Design
012.	Suspension		095.	Project Design
014.	Body Design - Car windshields, Automobile glass. i.e. Parking lights, headlights, etc.		097.	Body Design
			099.	Body Design
017.	Electrical Schematics		100.	Body Design
019.	Tool & Die		101.	Body Design
020.	Tool & Die Design		103.	Body Design
021.	Chassis Design		105.	Body Design
022.	Tooling		107.	Fastener
025.	Body Design		110.	Electrical
026.	Body Design		111.	Civil Engineering, Architecture
027.	Auto CAD		112.	Power Train
028.	Engine Design		113.	Tools and Gauges
030.	Body Design		116.	Structural Design
031.	Machine Tool		117.	Sheet Metal
033.	Product Design		122.	Power Train Design
035.	CGS.		124.	Machine Tool
039.	Interiors		126.	Engine Design
040.	Interiors		127.	Power Train
042.	Assembly Line /p/no		128.	Gauges
043.	Fixture design		132.	Engine Design
044.	Mechanical design		133.	Body Design
047.	Body Design		136.	Product Design
049.	Body Design		137.	Body and Product design
051.	Power Train		142.	Power Train Design
053.	Proto Type		143.	Machine Design
055.	Body Design		146.	Body Design
056.	Electrical Design		147.	Chassis Design
057.	Components		148.	Tool Design
059.	Engine Master Layout		151.	Auto CAD
060.	Machine Tools		153.	Product
063.	Blue Prints - Body Design		154.	Product and Body Design
064.	Die Design		155.	Product Design
065.	Tooling Fixtures		156.	Product
067.	Magnetics		159.	Currently Chassis
068.	Body Design		162.	Body Design
070.	Interiors		164.	Interior Trim
071.	Mechanical		165.	Tool Design
072.	Machine Tool		166.	Chassis Design
074.	Body Design		167.	Product (Fuel Rails)
075.	Solenoid		168.	Body Design
078.	Power Train Design		176.	Automotive Parts
079.	Fixture Design		179.	Tooling Design
081.	Machine Tool Design		183.	Machine Tool
082.	Layouts		184.	Body Design
083.	Body Design		185.	Sheet Metal
085.	Body Design		187.	Body structure design
			188.	Power train and body
			189.	Mechanical Design
			192.	None of the above, plant layout
			193.	Product design, Chassis parts

What additional training/knowledge would be helpful to you doing your job?

005. Classes are not beneficial to my job, resident teachers are so far removed from the industry, they have no idea what is going on, the changes in engineering.

012. More advanced capabilities of the system analytical capabilities.

019. More advanced classes, more "auto CAD" courses.

020. CAM side of CAD/CAM

021. O.C.C. CAD instructors could be more informed in so-called area of expertise. They need to be more through, especially the part-timers, "over-worked or don't care".

022. More in CAD & CAM with C & C.

025. More descriptive Geometry, more CDS classes required for degree.

026. OCC just added the CGS (Corporate Graphic System - GM) class which they didn't have previously. He learned this on the job so now he doesn't have to take it here.

039. Prime/PDGS are big in the field and not taught at OCC.

040. Offer more classes on actual design not just operating the computer.

049. CGS - classes needed, also need unigraphics.

056. Electronics auto CAD.

057. Accelerated courses, they are offered but not always available.

060. More of the auto CAD, assembly drawing.

063. More unigraphics classes.

064. Instruction in operating systems particularly Unix.

067. All versions Auto - CAD, version 12 from intermediate to 3-D level.

068. Basic computer course.

070. Finite element analysis.

074. PDGS (program that Ford has also: CAD KEY)

075. TRANSLATE, I use it every day on the job, but it was never formally taught!

078. CAE

079. In Auto Cad, more surfacing and modeling.

081. Auto CAD

083. Latest Unigraphic software.

090. Advanced drawing with computers.

100. More numerical control

101. Advance classes, specifically Unigraphics design & CGS.

103. OCC could have offered more design oriented classes, general body design

105. On-the-job training, offer more accelerated courses.

110. Electrical design

127. More 3-D on CAD-AM

128. Auto CAD

133. More additional CATIA

135. View Manipulation

136. Advanced Drafting

137. Drafting

142. More Unigraphics

143. Auto CAD is not required for my degree, but job requires that I learn Auto CAD.

146. Solution 3000

151. Robotics

153. More Drafting

154. More Drafting

155. Drafting and Kinematics

156. Drafting

159. Offer a true GD and T class. The current one is not relevant.

164. Trained on CAD-AM & CATIA, not CGS,

176. Pro-Engineer & also a variety of systems that are used in the Big 3.

183. Auto CAD

184. PDGS

187. Data management, CGS

188. OCC, is too technical, not broad enough designed to meet one type of job only.

193. Need to cover detail more in CAD, program CADAM is outdated use CATIA instead.

196. Pro-engineering, Computer Vision

199. Train for detailing, example basic changes (ECH), basic skill needed for entry level positions.

201. Unigraphics

204. Classes on manipulating data

Are there any other comments you would like to make about your experience in CAD courses at OCC? Specifically, do you have any comments that might be helpful to us as we consider whether or not to offer a Computer Aided Engineering option in the CAD program?

002. Software is ancient, needs to be updated.

003. Get the actual drafting to go along with the computer, don't get enough hands on experience with drafting.

004. You need more computers, more lab time needs to be available.

005. If option includes all the elements mentioned, if it honestly includes those elements mentioned it would be a good program. Take a group of people, from the industry, to put the program together.

006. OCC should offer more current up-to-date technology, the auto industry in into PRIME and CATIA. Too many courses are integrated such as CADAM.

007. Need to offer more available time slots for classes, don't just offer them one day a week.

008. Program should be more sensitive to what is happening out in the field.

009. For CAD 220, Production Design and Layout, instructor has more communication skills, poor presentation skills, more lab time needed, lab assistants not qualified, need someone talented enough to present information adequately. The department head has difficulty dealing with students, not empathetic.

010. More lab time needed

012. Expand lab hours and number of work stations

013. More lab time is needed for those who work days.

014. More computer lab time needed, assistance in the lab, teacher assistance, and students have to fend for themselves to get information.

015. More lab time is needed, the time is too limited especially at night.

016. Update the hardware, the more options added the more it slows down the program, i.e. Auto CAD Unigraphics" and current programs should be utilized in class, and CAD-AM is outdated.

018. More open lab time needed for evening students, "Unigraphics", and "CATIA" programs are needed to stay current with the industry, because the "CAD-AM" is being phased out at G.M., and utilize the lab that has been vacant for so long.

019. He's unhappy with many of the instructors in the CAD program, they seem to be uninterested in teaching or lack the necessary skills to teach even if they know their material. He's paying for these courses, unlike some of the students (from the "Big-3") who are there to meet employers' requirements (at the employers' expense), and wants to get as much as he can out of the courses, but feels he can't because of the lax attitudes of behalf of the students and instructors.

020. He would strongly recommend adding the offering, in addition to CAM courses, CAM takes CAD one step further and CAE takes CAM one step further. Also suggest adding more open lab time, more real world examples of CAD should be done in class with more up-to-date projects, more "auto CAD" classes.

021. I didn't get involved with the Co-op program, but I think it should be mandatory for graduation. Students should have to take a course that's structured exactly like the work place, so they know what they are getting into.

022. Thinks that OCC should use other software, we use software geared to CATIA which is OK for people who work for Ford's or Chrysler who can afford this. Smaller companies can't and this man suggested that OCC get another software such as Solutions 3000 so people who work for smaller companies aren't trained on something they don't have on the job.

023. Thinks they should have more evening classes for CAD. She wanted to take the CATIA but couldn't because it started at 4pm. For a person working full-time, 4 o'clock is not an evening class, since OCC offers several sections of the CATIA at least one should be at night.

024. The CAD program needs to be structured better. Needs more continuity or stability as far as the instructors are concerned. Seems like a lot of CAD instructors were hired at the last minute and didn't know exactly what they were doing. More lab time should be scheduled for evenings. Also, students should be given some sort of syllabus so they are aware of what they need to know before going on to the next class.

025. Thinks that there is not enough lab time. Lab is poorly run, OCC should install more tubes and get more personnel to provide better supervision over the lab.

026. Not enough lab time for people who work days.

037. OCC should fire the man who teaches drafting. His initials are T.S. He was arrogant and verbally abusive. Sally Kalson in co-op education is knowledgeable about CAD.

039. OCC should offer PRIME/PDGS; CGS. Students should learn the proper way to do a layout. Students should understand the "checker system" where (in the real work-world) someone checks work and critiques it for right and wrong. Have a problem with staff teachers.

041. When you go to look for a job, employers look at where you went to school. OCC is treated as one of the better schools for CAD training.

042. More lab hours, lab hours needed for students working during the day, therefore more evening hours needed.

043. More open lab time designed for evening students, extend the hours to meet all student's needs.

044. More hands-on experience, like actual work done in industry.

045. Learned more from interacting with other students than from professors, gives information but can not teach, and more diversified outside of the automobile industry.

046. Classes need to be geared working students lab times need to be expanded.

047. Update software to keep up with technology.

049. Make classes available other than 8-12.

051. More classes geared toward design work.

052. Need more computers and extend lab-time presently not adequate.

053. Offer classes earlier ex. 6 or 7 as opposed to 10 to midnight.

054. Class sizes overwhelming and it is hard to get lab time, make the size of classes smaller for the new option and provide additional lab time.

056. If its not a 4 year degree its a waste of time, OCC needs an electronics CAD degree 2 year, and more auto CAD.

057. More unigraphics needed, accelerate the courses currently offered, some of the courses are extensions of the other, no new information is learned, and it's more an overview.

058. OCC doesn't have enough computers, not enough lab time, not enough classes, if OCC offers a new program these problems need to be corrected.

060. Micro CAD AM is being phased out by most companies, and more Auto CAD is needed.

061. Not enough lab time allotted, which hinders the students from learning at his/her full potential, need to expand lab times to help people who work, and open labs are extremely crowded because there is not enough computers.

063. More open lab time, extended hours, Saturdays are to crowded, accommodate the working people.

064. Should enforce pre requisite ex. Descriptive Geometry for Advanced CAD classes.

065. Orient it more toward engineering than Design or let students know that it is Design oriented.

066. In the long run they have no choice to keep up with today's technology and keep it current. Need to be able to teach the classes, need to be sensitive to the student. They need to be able to get the ideas across to the students.

067. If they would offer Auto-CAD 12 version I would not need to transfer to Macomb. I took all Micro-CAD classes and there are presently no jobs in the field.

070. Need more open lab time at night for people who work. Also, more terminals and less doubling up.

072. When working two to a computer there's not enough time per person.

073. CAE would be more useful to more people than auto body program.

075. CADAM is structured well; CATIA should be structured more like it.

077. Would like to see more evening lab time.

078. OCC should offer more opportunities for Co-op training, it's extremely valuable experience for students.

079. CAE option, great idea. Students need more experience on the board as compared to the computer, which is now the case. This will give them a better understanding.

080. Eastern offers a drafting class in tolerancing. I think this is important. I have 2 uncles employed in the field and they agree this is a major thing to know. OCC's program only touches on the surface, needs to offer a whole class.

081. Kinematics and Solid Modeling definitely the way to go for the future. Need more open lab time.

082. Don't get enough time on the computer when you share. Not enough open lab time. Need it at night.

183. CAD classes set up very well. I'm very satisfied with everything except the lack of evening lab time.

084. Some instructors need to go step-by-step on the computer in front of the whole class. It's frequently easy to get lost. We need more clear handouts to follow along with.

087. The lab time has to be cut in half, because their are not enough computers for everyone. The rule is two to a computer. Lab Fee is $90.00.

098. Instructors will need to be better organized and good communicators. Also, computer systems are down a lot, we don't get through a lot of the course work because instructors are unorganized, miss sessions, or the computer system is down.

099. Get rid of the poor instructors, some instructors assume most of the students are already working in the field, so they don't take out the time to be thorough but skip information that beginning students might find helpful.

100. Not enough open lab time, evening students need evening lab hours available to them.

101. The hardware student ratio must be good, if there is not enough equipment CAD option will not be successful.

102. Most classes geared toward product instead of tooling, most jobs are available for tooling, lab time is during the day and limited, if there is a new course make sure flexible lab hours are available.

104. Instructors have very poor teaching abilities, teachers were there to brag not teach what they know, they didn't care if students were not in the field, get more caring teachers before considering another option.

105. Make the design more challenging, offer speed courses, updated courses, OCC is not keeping up with jobs, and CAD is accelerating at such a fast pace.

106. If an option is considered it should be part of a grandfather course, students who have completed half their courses in CAD should not be required to take this option at their expense.

107. Need more hands on experience

111. More intensive in lower CAD classes CAD100, nothing really learned, could have gone further in the class.

112. Offer these classes on weekdays along with the one Saturday class.

113. Need more open lab time in the evenings.

114. Offer more plastic component classes

115. CAD AM need to take 3 classes before CATIA, CADAM being phased out, find it unnecessary and a waste of time at least one class should be limited. Eliminate 130 and combine it with

120. Needs more hands on especially in introductory classes. When a class meets only once a week but have to share a computer and not being able to operate the function, it does not promote learning. Should be one on one learning experience and either more computers or smaller classes. More evening lab time, people who work can't get to labs before 5 pm. Misleading it's impossible to get a 2 year degree in 2 years. CGS is offered 8 hours on Saturday, it would be beneficial if CATIA would be offered the same way.

116. Need more free lab time in evenings. Most available time in morning, impossible for those who work full-time.

119. I think CAE is good for more advanced students. Presently they are going to Lawrence Tech. for this kind of training. Many beginning students like me could get more out of CAD110, 120, 130, if they were 30 week classes. Some of the Material is difficult to absorb when you're new to it.

120. Poor instructors, Micro CADAM was useless, too simple, get instructors who have better teaching skills.

122. CADAM is not a mainstream program, not useful in the field, offer more updated programs.

126. We need more CAD stations, I would go to lab in the evening to finish work not completed in class and their just was not enough work stations to handle the demand.

124. Not enough lab terminals, more open lab times

125. Need more lab times, people in the lab could not help if you ran into a problem

126. Further application on unigraphics, keep Harry Champion around to teach.

130. Need to focus on CADAM which are better such as CATIA, CGS and Unigraphics

134. Most of the jobs require CATIA not Micro-CAD so more CATIA and less Micro-CAD. More Auto CAD, employers are asking for it but OCC does not offer it.

135. Virtual reality; Unigraphics (solids); Kinematics are interesting to me, I would take classes in these subjects.

139. Part time teachers who don't know how to teach. Not enough lab time, overcrowded with 2 students to a computer, a lot of money spent but being short changed on education. They care more about money than the education of the student.

141. Co-ops are not helpful, hard to get a good job without a degree, associates or bachelors.

143. OCC trims on CADAM, CADAM not used now in the field, Auto CAD would be more useful.

150. Time on the CAD, out of class hours, more evening hours for people who work.

154. The CAE option should have been considered a long time ago, it is a good idea and it would have helped many graduates from the program, like myself.

157. Need to update from CADAM to Unigraphics or CATIA

158. Instead of Micro CADAM, more CATIA, I've spoken to 2 placement agencies and they tell me there is more of a demand in the industry for CATIA.

159. Some classes offered once a year. Have 8 classes which need to be taken in sequence. Sometime have to wait a year to take next class. Should offer classes more than one time per year.

160. Presently, the CATIA and Unigraphics programs are one Version behind what is being used in the industry.

162. There is no open lab time this term. Some people will be behind and run into problems later if not enough open lab time is available.

165. More evening lab time would be a big help to working student.

166. The associate degree program was excellent as far as I'm concerned, I believe the CAE option will be of even greater benefit to students.

167. They've cut back on lab time hours, it makes it very difficult.

168. Lower end courses should use CADAM, industry not using micro CADAM anymore, and higher end courses should use CATIA.

170. I understand OCC is switching to CATIA presently we're being trained on system that will be obsolete. More open lab time at times convenient for those who work full time.

171. I'm disappointed that we have to work 2 people to a system.

172. Add more terminals, extend lab hours.

173. When 2 people have to share the tubes hooked up to the mainframe it wastes a lot of time.

174. Intro to micro processors waste of time, doesn't relate to future job skills, should drop CADAM, and would like to see classes offered in Royal Oak.

177. Outdated. Too much emphasis on manual drawing, CAD 215 and 213 were excellent. Taught by designers from Chrysler, very relevant. CAE option is a wonderful idea.

178. Counselor knew little about the knowledge necessary to be successful in CAD classes. Students should be told they need to understand board techniques, and have taken math and geometry. Course description need to be more accurate in defining which software is used in which class. You need a set course of action for each class, different instructors are working in different ways. All projects and assignments need to be evaluated and made more accurate. There is not enough open lab time in the evening.

180. OCC has a good program. I think the CAE option is definitely along the lines that the industry is moving.

185. More lab time in the afternoons, evenings or Saturdays for people who work.

186. CAD plastics option is a joke, no-books, only 1st class offered, none of the other offered or if offered canceled. Instructors need to be available for help. Many times the instructor is gone and teaching left up to the teaching assistants. The teachers attitude seem to be to be they don't need to be in the classroom.

188. Good idea to expand, there is a need for this field in the job market.

192. Get more instructors to teach the CAD 220 class, the present instructor does not know how to present the information effectively.

193. Change CAD AM courses to CATIA courses, it would be more relevant to what the industry is using.

196. Auto CAD, great demand, little offering. Micro CAD AM/CADAM dying program, get rid of it, offer 110 to CATIA, cancel 120 & 130. Expand Unigraphics, Auto CAD, CATIA< Prime, re-evaluate. More open lab times. Accommodate working people at night, more night classes, example 5-9pm.

197. In CATIA need more in CATIA, draw mode, when I was entering the field it was necessary to have a background in CATIA.

199. Get rid of Micro-CAD AM & CAD AM is not being used anymore.

201. Auto CAD class was too short, many businesses use AUTOCAD, Micro CADAM get rid of it, looking at the industry, they just don't use it, get more pro-engineering, AUTOCAD , CATIA

202. CAD program does not teach you how to detail, the new option should include actual drawing and set an environment similar to the work place.

204. Option should include time management class, lab time needs to be provided for evening students, CAD program needs to take this option seriously, keep up with the industry.

206. More lab classes for evening students.

208. Lab hours are crazy, 2 people to a computer is not fair.

211. No longer with the program, dropped classes because of the lab hours

APPENDIX E

Employer Narrative Responses

05. **Do you think you company may begin to use any of these technical applications in the mear future? Please Explain.**

09. (NO) No real need yet
15. (NO) We have no need for CAE
37. (NO) Most are manufacturing, but we are doing construction.
42. (YES) Next year we will have a new dept. in CAD and Computer Aided Engineering.
44. (YES) We are a growing company, the CAE field is very important.
46. (DON'T KNOW) Our work is very specialized; at the moment I would say No. There are 600 firms in the industry, about 50 out size (80 employees), it's still a fragmented industry.
49. (YES) We will be getting into virtual reality as well as some modeling and rendering.
65. (YES) Automotive Industry is crying for CATEA trained and numerical control people. Chrysler is now using CATEA Version 4.
70. (YES) Our company has no need for CAE applications, maybe in a couple of years we will consider it, for our CAD employees.
74. (DON'T KNOW) We don't employ them now and I'm not sure what are needs will be in the future.
75. (YES) We supply tooling for the plastics industry, so we don't actually make things out of plastic, our customers do. We will probably use some of these technical applications, but not many. We don't compete with our customers.
77. (NO) As an electronics solid state manufacturer, working with electrical diagrams, circuit board routing, and layouts, these applications don't pertain to our business.

07. **What is the PRIMARY reason for hiring these employees?**

01. (OTHER) For placement
02. (OTHER) We're a placement agency.
03. (EXPANSION OF THE COMPANY) Vehicle Engineering and Design Firm
04. Expansion of the Company and Need people trained in new technologies, these two go hand-in-hand.
05. (OTHER) We're placing them with companies.
06. (EXPANSION OF THE COMPANY, EMPLOYEE TURNOVER, AND NEED PEOPLE TRAINED IN NEW TECHNOLOGIES) CATIA is the cause of expansion, PDGS is the cause of employee turnover, and all areas need updated training.
12. (EXPANSION OF THE COMPANY) Work load is expanding
23. A Combination of all three; Expansion of the Company, Employee Turnover, and Need People Trained in New Technologies.
25. A Combination of all three; Expansion of the Company, Employee turnover, and Need People Trained in new technologies.
33. (OTHER) N/A This is a placement agency, recruits design for quto and defense companies.
36. (OTHER) This is a recruitment agency for Auto Companies. Most auto companies hire this way.
38. Expansion of the Company and Need people trained in new technologies.
50. A Combination of all three; Expansion of the Company, Employees turnover, and Need people trained in new technologies.
52. (OTHER) hiring entry level for future staffing.
56. (OTHER) to supply clients' needs
66. (OTHER) To meet client demands for short term projects for automotive clients.

09.   What types of problems do you encounter when you are looking for qualified CAE trained employees?

04.   We gave up and trained our own. There are only a few out there and they go to the highest bidder.
05.   Not enough well trained people with enough experience
06.   New start basic skill fundamental, math geometry basic designer, process skill (lack or shortage of that knowledge)
11.   Limited backgrounds, limited "real world" experience, can't apply book knowledge.
19.   Can't find people who know the large variety of CAD systems we have. Lack industry knowledge. Most have a good knowledge of software but don't know how it is applied.
20.   Lack of experience, lack of training
21.   People are not technically skilled enough for what we need. Outside search people provide weak trained CAD people as canidates for employment.
23.   Teaching skills that entry-level personnel need. Students didn't get basic knowledge in the beginning. Don't need an overview of specialized information right away, they need an educational foundation.
25.   Especially in solid modeling and kinematics. Lack of experience. No internships. No hands-on experience.
28.   Shortage of people. If a company is located in the tri county area, close to Detroit, they have problems finding qualified people. Are recruiting out-of-state.
30.   Problem os, where do you look to hire them? Go to campuses, hired from Ohio State, none seem to be around here. People have CAD knowledge but no knowledge of forgoing industry.
32.   Most lack experience
33.   Clients usually want more than skills, they want experience.   A Co-op program is VITALLY IMPORTANT.
35.   You can't have schooling alone, people have got to have some experience.
36.   Lack of enough people with proper skills who are not aliens with visa problems or attending U of M or Wayne.
38.   Trained only on tube, no design knowledge.
47.   Hard to get people with some experience for current pay rate.
50.   Two year colleges are not offering training in CAE, we're getting 4 year degreed engineers who have the experience in CAE, but are too skilled to be sitting behind a computer server all day.
52.   Thet're lacking in the drafting skills
53.   Everyone is hiring CAE employees now, he's forced to recruit out-of-state because there's shortage in metro-Detroit.
55.   Students are not coming out of school trained in these areas. We hire only graduate architects.
56.   Limited hands on experience, especially with advanced functions.
57.   They can't do advanced functions, i.e. 3-D work.
58.   We just can't find qualified CAE people
60.   Lack of experience
63.   Most aren't at the skill level we require, especially in the area of CATIA
64.   Many want more money than their experience would support. Bool learning is great, but we have to train for own specific operation.
65.   Chrysler is hiring/needs designers, people need hands on experience.
66.   Have plenty of entry level applicants. Need people who have 3-5 years on the job experience.

10.   What is the MINIMUM education when you are looking for qualified CAE trained employees?

04.   They also hire CAD operators from High School.
06.   Training on specific platform information, software training.
11.   (OTHER) Equivalent "real world" experience.

19. Associates degree with experience.
20. Bachelor's degree for Ford employees, and for in contract employees; experience is more important than education.
23. (OTHER) Said Harold Philpot offers a 1 year design course which is very good. Also, 2 former chrysler employees, Lewis & Hanke, offer a similar 6-month course that's very useful.
25. (Bachelor's degree) plus 3 years experience
26. (Bachelor's degree) plus 8 years experience, in CAD some have Associates degree.
28. (Associate's degree) plus experience
30. Look at experience and education.
31. (Other) Weigh education and work experience.
38. (OTHER) Design school courses
50. (OTHER) Company training, program software design packages
63. (OTHER) We hire at varying levels depending on the job. Must have some design and CAD background. We also take journeymen and convert them to designers.
66. (OTHER) Must have clear understanding of AUTOCAD and 3 years experience, and have qualifications to meet clients need's, these vary.

13. Are there other technical skills you think we should include in our Computer Aided Engineering curriculum?

01. Must understand operating systems of computers, must know specific software packages being used in the industry.
03. CAE applications. (Translation between tools and quality of end product)
04. Simulation of circuits (electrical, hydraulic, pneumatic)
07. Basic math class, math skills are very important.
08. Course in geometric dimensioning adn tollerancing; basic math skills and basic drafting.
10. Internship, he sees lack of practical application skills of young people coming in.
11. Some preliminary basic drafting classes
12. Basic everyday detailing, ability to read a blueprint, understand basic drafting.
13. Drafting
14. Drafting is a good start
16. Detailing and drafting
17. Drafting
18. More drafting should be added
19. Descriptive Geometry, experience/training on the drawing board.
21. Through knowledge of discriptive geometry
22. Exposure to machine layout, machine-tool layout, design layout, and process layout.
23. Manual drafting experience and skills, how to read.
24. Most people who draw on CAD lose vision of what the thing they are drawing is going to do. People should get back to old-fashioned drafting. One semester of plain drafting can familiarize people with basic concepts. This is needed as a foundation and you can build from that.
25. Stress kinematics good for all manufacturing-side people
31. Drafting
33. Technical writing, Resume writing, and interviewing skills
35. Applied mechanics, structures
38. Data management
46. just basic engineering courses
48. It is very important work experience as well is they want to get jobs.
49. Conceptualizing
50. Sub topics in Finite Element Analysis, i.e. thermis, fluid, stress (affects on parts)
51. Intro to electronics circuit design, simulation and simulation analysis (prototypes)
52. Awareness of drawing skills, 3-D graphics, geometric dimensioning and tolerance
53. Drafting and design technology

54.	"CATIA" "IDEAS" hands on program
59.	More drafting, blue print reading
60.	Drafting 2D and 3D
62.	Wire framing
63.	Basic understand Trig, and compound angles
64.	Any you can relate to a machine shop, cutting, welding, or CMM inspection areas.
65.	Typing
72.	Drafting
76.	Solidification, mold flow (Analysis)

14. At OCC, all students enrolled in degree programs must complete a group of general education courses in fields such as English, math, writing and social science. Are there basic educational skills you look for in new employees? Please specify:

01.	Must be able to communitcate verbally, to write reports, and people skills are also very important. Must have courses in psychology and intro to management.
02.	Math, English, written and verbal skills, we like to see at least a "B" average
03.	Technical writing
04.	Computer skills, such as word processing, data base, and spreadsheet
05.	Should be well-rounded educationally, it's more important to me that they have go job skills.
06.	Math skills extremely important, communicate, reading and writing, should have a general studies bachelor then go into technical field.
06.	Ability to read electrical or mechanical blueprints
10.	Oral and written communication skills, people skills getting along with co-workers.
11.	Technical writing, good grammer, good use of English language
13.	Math
14.	Math
15.	Math
16.	Math
17.	Math
18.	Math 3.0 G.P.A. or better
19.	Hard math classes, drawing, engineering, communicating
20.	All basics equally weighted. Communication skills are important, writing, public speaking, giving presentations.
21.	Technical writing, public speaking. Some understanding of team work, quality control, basic statistics.
22.	English, we are a small company, so employees do not just sit at a computer, must be able to meet the public. Must have people skills.
23.	English is so important, need it for everything. Thinks all the above are important, a mark of a well-educated person.
24.	Wants somebody who is willing to work on a regular basis, someone who is willing to come in 5 days week,work an 8 hour day, and is eager and willing to listen to directions. Finds that new generation of workers are sorely lacking a work ethic. He interviewed 25 people for the last job opening and hired someone who didn't have the background but who really wanted to work.
25.	English classes. Need oral, written, presentation skills. Need assertiveness training. Confield management training.
26.	Technical writing
27.	No. 1 is Math then English - need to be able to converse and write intelligently.
28.	Solid basis in Math, ability to read, write, and spell. Some vocational training or ability to dress, talk and act professionally.
29.	P C background
30.	Technical writing skills, verbal skills, team working skills.
31.	Math, English, Communication skills, Business classes
33.	All computer skills (DOS), Math, and good basic writing skills.

34. At this company you need speed. basic CAD courses, and the ability to push the work out.
35. Require all basic educational skills
36. Communication skills, both speaking and written are very important.
38. Writing and communication skills, creative and technical writing
40. English and Math
41. Math
42. Math and English
43. Math is very important.
44. Math
45. Math and English
46. Should be well versed in all educational skills.
47. Communicatin skills, verbal and written, and good math skills.
48. Should have all basic skills
49. should have good general education
50. Math, Calculus sequence, etc.
51. Ability to read, write and speak. English composition 1 and 2, public speaking, organizational structure and dynamics, team players.
52. Math-college algebra, descriptive geometry. 3 levels- subject level mastery
53. Students need a strong math background including calculus sequence
54. Math 2-3 classes in calculus
57. Yes, communications; speaking, writing, critical thinking skills. Physics - math through calculus (1st semester)
60. Math
61. Science, Math
62. Math
63. All communication skills are important; reading, writing, speaking, and listening
64. Math, drafting, basic P.C. skills, also English, you must be able to write reports and communicate effectively.
65. Students need to know how to communicate effectively. Need to learn working together skills (TEAM WORK)
66. Mathematics - trigonometry
68. Basic communication skills. Should have geometry and trigonometry plus general or light physics or chemistry classes.
69. The basic is fine
70. The basics are fine
71. Only the basic courses
73. Math
75. Computer skills
76. Technical writing and public speeking

15. How would you categorize your company type?

01. (OTHER) Technical Placement Service, and in-house electrical circuit board design.
02. (OTHER) Technical Placement Service
03. (OTHER) Vehicle Engineering and Design firm.
5. (OTHER) Technical Placement Service
19. (OTHER) 2nd largest supplier of CAD/CAM product. Training center Unix and other computer stations
29. (OTHER) After market
33. (OTHER) Temporary (6mon. to 3 yrs.) or permanent Placement Company for Technical Employees, (Designers and Engineers), in the auto and defense industries.
34. (OTHER)Machine tool design
36. (OTHER) Recruit technical personel for auto companies
41. Machine tool manufacturer
49. (OTHER) Architectural Engineering

55.	(OTHER) Architectural
64.	(OTHER) automotive prototype
66.	(OTHER) A CAD Engineering Service Contract CAD services for clients in automotive field.
74.	(OTHER) Contract all phases of machine tool industry
75.	(OTHER) Build and sell tools for plastics industry
76.	(OTHER) Manufacture products (cast metal) for auto industry. Also, tooling and development

20. Would you explain what types of on-the-job training your compnay offers to your employees?

04.	Auto CAD seminars, we're training ourselves on mew software
06.	Data Acquisition - Data transfer
07.	New employees in CAD Dept. review their Auto CAD book for a couple of days, start off slowly, and are monitored by superviser. There is no formal training program as such.
08.	They have formal training for their own. Particular CAD systems - EDS Unigraphics
13.	On site training by company employees
14.	On site training by company employees and seminars
15.	On and OFF site training conducted by company employees
16.	On and OFF site training by company employees
17.	Mostly on site training by company employees
18.	On site by company employees
19.	Interface with Ford for Ford's needs. Make sure employees know the latest UNIX and different languages, for example, SUN language was just changed to SOLARIS
20.	UNIX classes at Computer Version in Dearborn, cross training (learn one job then going to another) in-house.
21.	Provide training in CGS (Computer Graphics System) and Unigraphics language. Offer no CATEA or PRIME
22.	Have to know CAD, give hands on training on our process, informally.
23.	Conducted CGS and advance surfacing, data mgt.
24.	Employees work with operations manager who takes them under his wing and provides them with individual training as needed, there is no formal type of training program as such.
25.	Classes on ARIES software for Engineering both lecture and lab classes
26.	Has 47 class titles (for formal training) and are developing new titles daily on new technology in CAE, CAD, etc. Most are occupational specific and are targeted at a specific job. Have both classroom and on the job classes.
27.	Have formal classes in CATEA, Version 4, Have so many who want/need classes that it takes 6 months to be scheduled
28.	Formal and on-going for GM Graphics using CGS and Unigraphics. Training; new user and up-grade training. Program; 2 weeks (80 hours) for unigraphics people. GM is changing from Unigraphics Version 9 to Version 10.
29.	Hands on and vendor training. Federal Mogul has a prescribed training program which progresses grom basic design to "Super User"
30.	No formal training is on an "as needed" basis. Progressive training - person works through certain levels from simple detailing to more complicated detailing to assembly.
31.	Training on new versions and up-dating on all (#12, a-i) mentioned. Installing a new CATEA system and are training for that. Have a training center.
32.	Primarily for our Ford customers and what they require. May be in house or vendor provided training.
34.	Only one employee helping another - nothing formal
35.	Seminars in modeling techniques, use of finite element modeling software codes, etc.
36.	Some clients (like GM) will train our employees on their new systems
38.	Instructors come in and upgrade different upgrades of software programs
40.	All training is conducted off site by express in the field and company employees
42.	Seminars and on site training

43. On site training conducted by company employees
44. On site training by employees
45. On and Off site training by company employees and experts in the field
46. Senior people provide on-going training, we send staff to other locations like; Inacomp Macomb Comm. College, etc.
47. CAD train engineers who don't want to be designers, Cross-train employees from one system to another
50. specific design packages, i.e. "Unigraphics" and "Cosmos" Packages
51. "How-to" software packages and upgrades
52. "Unigraphics" courses and updates, Corp. Graphics system (G.M.), CGS basic/advanced surfacing (2 week course) cgs, overview of CGS, reading/drawing orientation (RDO)
53. Geometric dimensioning tolerance, mold design, plastics design, gear design, basic "UNIX" training class "Pro-Engineer" CAD package training. Finite element analysis training including subtopics. DFM & DFA training
54. Auto CAd training
55. Employees need to be trained when there is a system upgrade, this is done in house
57. More advanced CAD functions, i.e. modeling
59. Seminars and training conducted by company employees
60. On the job and off the job training, by experts in the field and company employees
62. Seminars training conducted by professionals and company employees, on and off the site.
63. We develop individual training plans. We also have on-site CAD and CATIA training taught by EDS
64. Our employees are full-time and go to school part-time, we give 100% tuition reimbarsement. We have apprenticeships
65. Chrysler conducts their own in house formal education plus they require time on the job where an instructor is available to help when needed. It takes about 1 year to school/train an employee before they are productive. Example. For kinematics: Employer must complete the course plus 40 hours on the job training.
66. Are part of CADI corporation which is a software retailer. They have virtually everything available to them, they use the software to train. Especially, AUTO CAD and other types of Engineering CAD.
68. General tool and die set of training. Cold form stamping adn extruding die training. Teach extrusion forces and materials, the forming of different materials and differnt types of steel.
72. On site training by company employees, some seminars.
73. On the site training by our employees
75. If someone is hired to work on a specific CAD system, we might train them ourselves. Many times we send employees out for training. (O.C.C. as well as other schools)

21. OCC offers specially designed training and education programs for individuals and groups. Does your company have training or education needs that might be met in this way?

01. Possibly with our in-house electrical (printed circuit Bd design, etc.)
02. We haved worked with OCC in the past -- possibly.
06. Any of the fundamentals, i.e., blueprint, math, basics in geometry and trig.
10. Nothing comes to mind right now but they've had outside people come in the past. The last one was for a Dale Carnegie course.
11. Advanced CAD, tool path analysis, advanced engineering.
20. Uncertain, should contact Tom Bacus, Manager, CAD/CAM Support (313) 248-7799.
21. May have a BPI person contact him about all the subjects we talked about earlier. GM should have an on going dialogue with OCC to find areas where we can "fit" -- so far, that hasn't happened. We should try to get together because we are in each other's back yards.
22. Have BPI contact him. Send brochure.
23. Said we should call the Human Relations Director, Tina Tribuzio and she'd be able to answer
25. Send brochure. Involved with U of M, Dearborn in C classes.
26. Currently negotiating with Dr. Rose of OCC on curriculum that is directly related to Chrysler.

27. Send brochure on BPI.
28. Currently have a credited Car Door Design Class being presented by OCC.
29. Send brochure on BPI.
30. Send brochure on BPI.
31. Send brochure on BPI. (Might use classes on new and current things on the market.)
32. Send brochure on BPI.
36. We are thinking of bringing in experts (instructors) in each discipline for brief in-house workshops for our recruiters and salespeople to keep us current.
38. Always looking to train people in CAD Data Management, Various tube training CGS, CATIA and Unigraphics.
42. Quality Control, Automation.
46. Maybe. Our employees always direct us to the courses and instructors.
47. Would like more information.
49. We already have checked with OCC regarding engineering. They were unable to help us.
50. Yes, on work site or at campus if there's a need. We will contact the college.
51. Although it's being done through W.S.U./Dale Carnegie -- there needs to be an interest.
52. OCC hasn't been responsive to our needs. We'd love OCC to be a source for co-ops.
53. We are already sending students to OCC--we might re-open our co-op program and include OCC.
54. Not sure at this time.
56. We have clients who ask for 15-20 employees with a particular skill--there may be a need to train those employees as a group.
57. We are already working with the BPI on a team-building program.
58. Yes, however, we're located in Plymouth, and most employees wouldn't drive to Auburn Hills.
62. We are considering sending employees to school for DOS training.
63. I'd need more specific information before I can answer.
64. We have utilized several programs in the past and will continue to do so.
65. Send a brochure. "Chrysler's needs are so specialized, it's hard to say yes or no."
66. Send a brochure about BPI. We "might" consider classes in solid modeling and CNC-type classes.
68. Uncertain, company is looking into having some classes on SPC (quality control). Send info on BPI to Mr. Casey. OCC should contact the Quality Control Manager, Craig Bauer.
69. Yes, CGS.
71. CAD training, automotive applications.

23. **Is there anything else you might want to share with us as we consider whether or not to design a Computer Aided Engineering Program at OCC?**

03. There is a lot of focus on tools--need more focus on applications (solving problems).
04. Colleges are missing the boat on Hydraulic circuit training.
05. I think it's a good idea.
06. OCC's program should be flesible enough to go along with the constantly changing technology. Perhaps, if OCC could have quarterly classes to keep up with all the latest developments in the field.
08. Real encouraged that OCC is doing this.
10. No, thinks we've covered all the bases.
11. The computer systems that students are trained on should be state-of-the art equipment. If a student is trained on an obsolete computer system, once they start working, it takes at least 3-6 months to get them up to speed on systems corporations are now using.
12. No, covered everything.
19. Make sure to purchase software packages like AUTO-CAD; 2D - 2 1/2D; PDGS (PC based products); CAD 5 before moving up to work station products.
21. Suggest OCC does not duplicate Macomb program. Try to be different. Perhaps, best to concentrate on tool and die related or fixtures (not body). I believe OCC would have better results. I want OCC to demonstrate that their students are equal to- or better than, Macomb's but, so far, that has not happened. OCC is putting out people who know how to make the computer do all the CAD functions but do not

know how to apply that to problems. They know the computer but do not have knowledge of the design side or design areas.

22. Sounds like a very beneficial program--like to see the schools tieing in with local companies.

24. Thinks students should have knowledge of tools and equipment that they need to make parts. They should e able to follow design from beginning to end and know their tube and machines. This all comes back to nowledge of basic drawing. Also, people should display some good old common sense.

25. Need to stress the importance--it's necessary to have a background or to be exposed to CAD/CAE. ven if people are not interested in going into it, people should have an awareness of it.

26. Make sure the end of the program can lead into a 4-year degree program.

27. May FAX some suggestions.

28. Am an advocate of OCC and Macomb C.C.s Auto design programs. Produces outstandingly well-trained students. Worked with Tom Sawasky (of OCC). (80% of Cadillac Luxury Car Division's CAD people are contract people.)

29. Sounds like OCC has covered it all--sounds like a good idea.

30. Keep up with what is going on in the real world. Schools are usually two softwares behind what is used in the field. Try to keep up with advancements in industry and try, in some cases, to out guess industry in what is needed in the future. Look to emerging industries, from large to small, try to see how small firms can help (or fit in) large industries' needs.

33. Important to keep very current--use only the software used in real world. Example: CATIA = Chrysler; CU4x-5x = Ford; UGII = GM. Also important: Pro-Engineer (Para-metrics Technology).

35. You can't turn out engineers from a two-year college. These people will work as modelers, assistants, etc.

36. Good move!

38. A lot of jobs out there--people in the field who want to upgrade--people currently not employed in field-- might have a hard time finding a job.

47. Great idea.

48. 1) These people will need experience as well as education. A good co-op program is essential. 2) The CAD focus has been auto body design. The future lies in design for manufacturing.

49. Could offer some architectural engineering courses.

50. OCC is on the right track in doing this research--emphasize Finite Element Analysis subtopics mentioned in Q. 13.

51. This should not be incorporated into a 2-year degree unless you're developing an engineering technology degree.

52. Emphasize drafting in addition to computers. Take out computers if given the choice between drafting and computers.

53. OCC should teach software packages "CATIA" and "Pro-Engineer" in addition to AUTO CAD.

54. It's a good idea.

55. OCC is headed in the right direction.

56. It's a great idea.

57. It's a good idea.

58. Please send literature regarding program.

63. Before students begin CAE program, they should have a good background in basic drawing. They should understand board skills thoroughly. They should also have an understanding of what's important to the customer.

65. Whether OCC adds CAE should not be an option--should be considered a "must do, a certain." Make sure that it is a hands-on, state-of-the-art program. The program should work hand in hand with leaders in the industry--Chrysler, Ford, GM--people with foresight to guide OCC in real world applications.

66. From my schooling, I found that part-time instructors who had jobs in the industry were the best CAD instructors. They taught what is being used in the real world.

78. Make sure you keep current with the software being used in the industry.