Electrical Trades Technology

Needs Assessment

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HIGHLIGHTS

Purpose: The purpose of this report is to review current industry needs and educational responses related to the Electrical Trades Technology (ELH) program at Oakland Community College (OCC).

Methodology: This report includes an extensive literature review, information obtained from telephone interviews with industry experts, and analysis of data collected from telephone surveys with employers and current or former OCC students who have enrolled in Electrical/Electronics Technology Core Courses (EEC) and/or Electrical Trades Technology (ETT) courses in the last four semesters (Summer 1995 through Spring 1996).

Existing Program: The Auburn Hills campus of OCC offers a Certificate of Achievement program as well as an Associate of Applied Science (AAS) program in Electrical Trades Technology. In addition, OCC Workforce Preparation Services offers two programs which are closely related to Electrical Trades Technology: Mechanical Assembler Technician-Robotic Panel Wiring; and HVAC/Refrigeration/Maintenance.

Occupational Outlook: The national demand for electrical technicians is expected to increase by 23% through the year 2005, due to the increase in the output of technical products. Nationally, the best occupational opportunities for electrical technicians will be for available for graduates of two-year technical training programs. Statewide employment for electrical technicians is expected to increase by 32.2% through the year 2005.

Wages: Respondents to the employer survey indicate that the median wage for entry-level electrical technicians in this industry is $8.79 per hour.

Level of Education /Training Needed: Statewide information indicates that an individual may be employed as an electrical technician if they have one of the following: a certificate, an AAS degree, certification, is an Apprentice, or if the employer provides on-the-job training. However, 69% of the local employers surveyed indicated that they require only a high school diploma for employment as an electrical technician.

Student Survey Analysis: Overall, students were satisfied with both EEC and ETT courses, although some did indicate, among other things, a need for more lab time and hands-on experience. At the request of faculty, student transfer information was sought. However, there were only two students in the survey sample who had transferred to a four-year institution; therefore, conclusions could not be drawn.

Summary: Results from this report indicate that the field of electrical trades technology is on the rise both nationwide and in Michigan. In addition, students appear to be satisfied with both EEC and ETT courses.

Oakland Community College
Electrical Trades Technology (ELH) Assessment

INTRODUCTION

The purpose of this report is to review current industry needs and educational responses related to the electrical trades industry, as well as to develop an understanding of student satisfaction in Electrical/Electronics Technology Core Courses (EEC), and Electrical Trades Technology (ETT) courses. The program being reviewed in this assessment is the Electrical Trades Technology (ELH) program at Oakland Community College (OCC).

The report includes a literature review, information compiled from telephone interviews with industry experts, and a review of similar programs in other higher education institutions. Telephone surveys of businesses employing individuals in this field, as well as students who have enrolled in classes in this program within the past four semesters (Summer 1995 through Spring 1996), were also conducted.

Several students from different programs take both EEC and ETT courses, which are not required of them. One of the reasons for conducting this assessment is to determine whether or not the ELH program should be restructured to consist of one program heading, with several tracts of study for the students to choose from. For example, a student could receive and AAS in Industrial Technology, with a specialization in Electrical Trades Technology, or Robotics.

DESCRIPTION OF EXISTING PROGRAMS

Electrical Trades Technology (ELH)

The Electrical Trades Technology (ELH) program at OCC offers the student the opportunity to obtain a Certificate or an Associate in Applied Science degree (AAS) (Oakland Community College Catalog, 1996-1997) (See Appendix A). The student will then be prepared to apply for entry-level positions in various occupations in the field of electricity and/or industrial electricity as an electrical technician. If the student completes the AAS degree, which requires completion of 62 credit hours, he/she has the option to transfer to several four year institutions which participate in the 2 + 2 program. The 2 + 2 program allows a student to transfer into a Bachelor of Science degree program at the mid point, provided they have completed the AAS.

Enrollment Trends

Students who have enrolled in EEC courses were used as a sample for the student survey, and in some cases, students who have taken both EEC and ETT courses. Therefore the sample was not limited to ELH students only. This sample was chosen because students in the ELH program, as well as several other programs, must take EEC courses. Students in some of these programs, as well as other programs, also take ETT courses. In addition, faculty were interested in determining the skills and knowledge that students felt were lacking, or were strong points, in both EEC and ETT courses.

Trends in headcount for EEC and ETT courses can be seen below (See Table 1, Figure1). Enrollment in ETT courses over the past five years has remained stable. However, enrollment in EEC courses has declined slightly over the past five years. We do not have the information to explain this drop in course enrollment.

Table 1

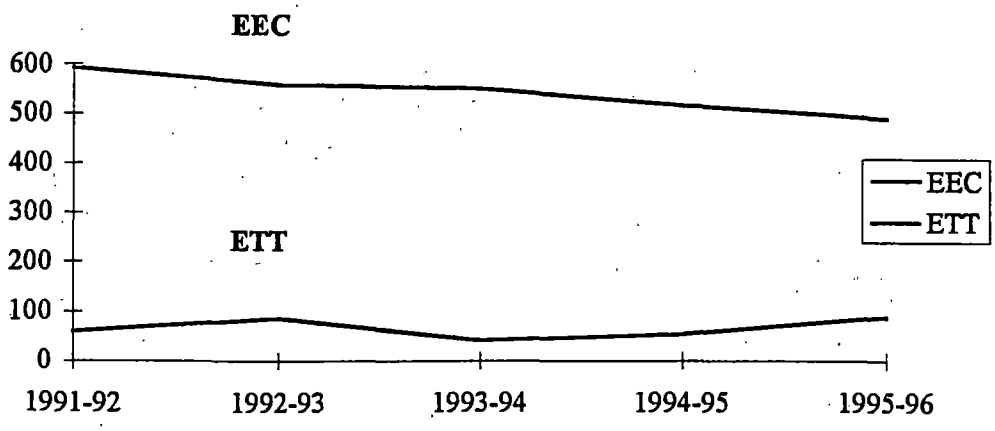
Trends in Annual Student Headcount for EEC and ETT Courses

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

	Academic Year				
	1991-92	1992-93	1993-94	1994-95	1995-96
EEC	593	559	551	517	490
ETT	59	85	41	53	87

Figure 1

Trends in Annual Student Headcount for EEC and ETT Courses



OCC Workforce Preparation Services

In addition to the ELH program at OCC, Workforce Preparation Services has two programs that are related to electrical trades: Mechanical Assembler Technician-Robotic Panel Wiring, and HVAC/Refrigeration/Maintenance. The programs are currently placing graduates in jobs at a rate of approximately 80%.

The Panel Wiring program is a six week program with a minimum of 100 hours, which provides instruction in both classroom theory and on-the-job training. Completion of this program will result in a foundation for a career in the robotics/electronics industry.

The HVAC/Refrigeration/Maintenance program is a 22 week program with 540 hours, and is designed to qualify students for careers in maintenance, heating, refrigeration, and air conditioning as salesmen, application technicians, representatives, installers, service technicians, and maintenance mechanics, as well as many other related skilled and semi-skilled positions.

Although these students do not take EEC or ETT courses, these programs are a part of OCC, and are closely related to the field of Electrical Trades Technology.

DESCRIPTION OF RELATED OCCUPATIONS

Electrical Technicians

The Electrical Trades Technology program at OCC prepares a student for employment as an electrical technician. Electrical technicians apply theories and principles of science, engineering, and/or mathematics to help manufacture, maintain, and service a variety of electrical components and equipment. Electrical technicians may also be known as electrical or electronic engineering technicians, and they may assist electrical engineers in research and development.

Electrical technicians may specialize in the following areas:

Semiconductor-development technicians: test semiconductor devices and evaluate test equipment to gather data for the engineering of new designs.

Instrumentation technicians: develop, set-up, and operate instrumentation used to test mechanical, electrical, or structural equipment. The data is then translated by the technician for use by engineers.

Calibration laboratory technicians: test, determine the caliber of, and repair mechanical, electrical, and electronic instruments in order to meet standards. They also assist engineers in developing standards for calibration.

Electrical technicians may also work as salespersons or field representatives for manufacturers, wholesalers, or retailers giving installation, operation, and maintenance advice (Michigan Occupational Information System MOIS, 1995-1996; Discover, 1996).

METHODOLOGY

To obtain information about the field of electrical trades technology, a literature review was conducted, and 85 local employers were surveyed by telephone (See Appendix C and D). Employers were asked questions about employee preparedness and skills, salary ranges, level of education necessary for hire, and trends in the future. Employers were also asked to identify job titles at their company for more detailed employment analysis (See Table 2, Figure 2).

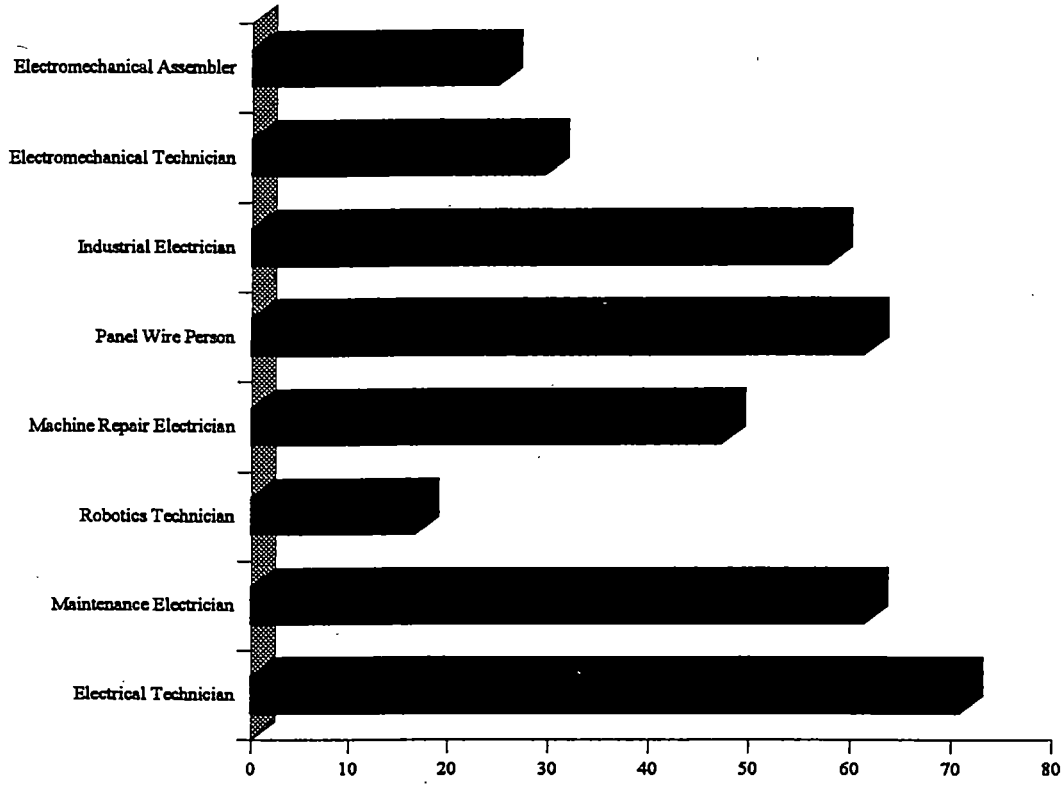
Table 2

Percentage of Employees with Selected Job Titles

Job Title	Percent
Electrical Technician	70.6
Maintenance Electrician	61.2
Robotics Technician	16.5
Machine Repair Electrician	47.1
Panel Wire Person	61.2
Industrial Electrician	57.6
Electromechanical Technician	29.4
Electromechanical Assembler	24.7

Figure 2

Percentage of Employees with Selected Job Titles



In addition, students who have taken EEC courses (Electrical/Electronics Technology Core), and in some cases both EEC and ETT courses (Electrical Trades Technology) in the past four semesters were contacted and surveyed (See Appendix E). A total of 122 student surveys were completed. Selection of students for the survey was based on enrollment in EEC courses. All students who are in the ELH program must take both EEC and ETT courses, while students in other related programs, such as Environmental Systems Technology (TER/HVF), Robotics/Automated Systems Technology (ROB), and Computer Integrated Manufacturing Technology (CIM) must also take some of these courses. One of the primary reasons for conducting this assessment is to determine whether or not this program should be restructured to include several tracts of study under one program heading, in that several of the same courses are taken for different programs.

Quantitative analysis of the employer and student surveys was conducted by frequency distributions, cross-tabs, and correlations. Verbal responses were analyzed for their content (See Appendices F and G).

ANALYSIS

Occupational Outlook and Employment Opportunities

Nationwide

According to the Bureau of Labor Statistics (Discover, 1996) the category of electrical/electronics technicians and semiconductor process is expected to grow by 23% through the year 2005. This growth may be a result of the increase in the output of technical products. The best occupational opportunities will be available for graduates of two-year technical training programs.

Statewide

Statewide employment (as indicated in MOIS) for electrical/electronic technicians is expected to increase at a rate of 32.2% through the year 2005. There is an estimated average of 300 yearly openings; 200 of these openings will be due to industry growth and 100 to replacement. This growth of 300 per year is expected because of the increasing use of electrical power, industrial expansion, electronic automation, technicians to assist the growing number of scientists and engineers, and the growth of such fields as energy production and environmental protection. In 1992, there were about 9,000 electrical/electronic technicians in Michigan, most of whom worked in urban areas.

Education/Training Opportunities

Statewide

On-the-job training, a Certificate, an Associate Degree, or an Apprenticeship may qualify a person for employment as an electrical technician. Although not required for employment, certification may be obtained with acceptable training and education.

Local (Employer Survey Analysis)

Of the 85 employers surveyed, 69% (54) required only a high school diploma or GED for employment in their companies in the area of electrical trades. An additional twelve of the employers indicated that they do not hire anyone who is not trained by the union. The remaining employers indicated various levels of education necessary, for example certification, a Certificate, and Associate degree, etc. (See Table 3, Figure 3).

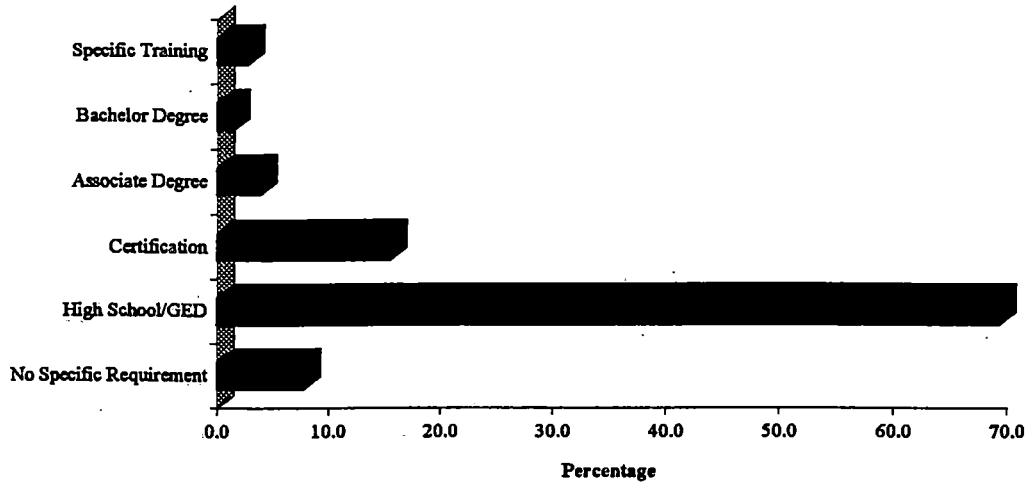
Table 3

Minimum Level of Education Required for Entry-level Employment

Educational Level	Percent
No Specific Requirement	7.7
High School/GED	69.2
Certification	15.4
Associate Degree	3.8
Bachelor Degree	1.3
Specific Training	2.6

Figure 3

Minimal Level of Education Required for Entry-level Employment



It is apparent from the employer survey analysis, that a high school diploma or GED is the minimum educational requirement necessary to obtain employment as an electrical technician in Southeastern Michigan. However, the information from employers contradicts what was found in the literature regarding national employment opportunities. Recall that it was stated that employment opportunities for electrical/electronics technicians will be best for those who have an AAS.

Sixty-two (73.8%) of the employers surveyed indicated that they provide training for their employees. The following figure indicates the type(s) of training provided by employers. The most popular type of training among employers is training that is provided on-site from company employees, with 74% (46) responding that this is the type of training they provide. (See Table 4, Figure 4).

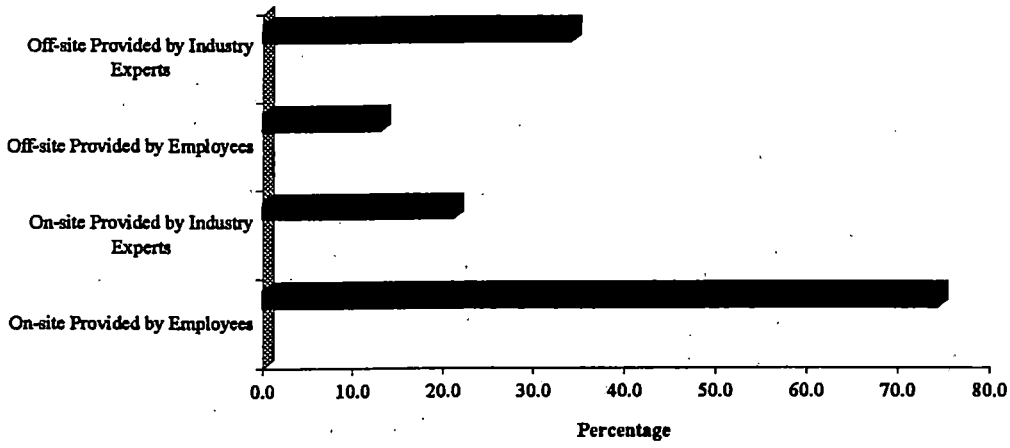
Table 4

Type of Training Provided by Employers

Type of Training	Percent
On-site Provided by Employees	74.2
On-site Provided by Industry Experts	21
Off-site Provided by Employees	12.9
Off-site Provided by Industry Experts	33.9

Figure 4

Type of Training Provided by Employers



Employee Wages and Benefits

Nationwide

Nationally, according to *Discover*, the average starting salary for electrical/electronic technicians was $20,500 in 1995, while the average salary for all workers in this field was $34,000, and was $63,500 for those with experience. For those electrical/electronics technicians who were working for the federal government in 1995, the average salary was $42,436.

Statewide

Earnings for electrical/electronics technicians depend upon their education, experience, ability, and technical specialty. In 1994 in Michigan, the annual average salary for these employees was between $27,744 and $36,996. Electrical/electronics technicians in Oakland County, who worked for government agencies, averaged between $23,227 and $33,350 in 1994.

Benefits for these employees usually include paid holidays and vacations, health and life insurance, and retirement plans. Some employers may also pay for further education and offer stock or savings investment plans.

Local (Employer Survey Analysis)

Local employers were asked for the average entry-level salary/wage for electrical technicians. The salary/wage range varied widely, but the median entry-level wage of the 74 responding employers was $8.79 per hour. The following table provides the mean, median, and mode entry-level salaries/wages paid by local employers (See Table 5, Figure 5).

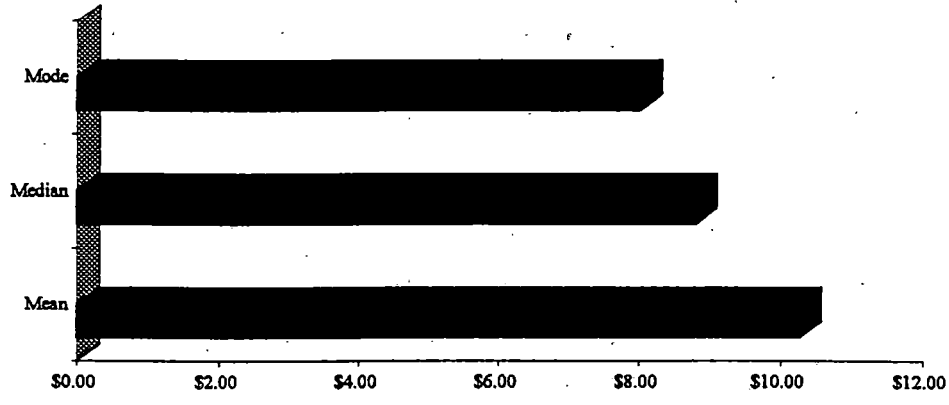
Table 5

Entry-level Wages for Electrical Technicians in the Local Area

	$ Per Hour
Mean	$10.25
Median	$8.79
Mode	$8.00

Figure 5

Entry-level Wages for Electrical Technicians in the Local Area



Advancement Opportunities

Nationwide and Statewide

Electrical/electronics technicians usually begin working under the close supervision of an engineer, an experienced technician, or a scientist. After gaining experience, they begin working under less supervision, and may eventually be promoted to a supervisory position. With further education, electrical/electronics technicians may become engineers.

Opportunities for Women and Minorities

There was not a sufficient amount of information in the literature making reference to women and/or minorities in the field of electrical trades. However, we were able to gather the following data from MOIS: according to the 1990 Census, 13.3% of the electrical/electronics technician occupation were female, 7.1% were Black, 1.4% were Asian and Pacific Islanders, and 1.0% were those of Hispanic origin. Of the 122 students surveyed for this report, only 14 of them were female. In addition, of the total survey sample of 122, 103 students were white, 12 were black, three were asian, two were hispanic, and one was foreign. This information indicates that the field of electrical trades is comprised almost entirely of white men.

Adequacy of Currently Available Training

Electrical Trades Technology Programs in Michigan

Henry Ford Community College: There is an Associate in Science degree in Electrical/Electronics Technology at HFCC which requires the student to complete 62 credit hours. HFCC also offers an Automation/Robotics option in the Electrical/Electronics Technology degree program which consists of 64 credit hours.

Kalamazoo Valley Community College: KVCC offers a Pre-Engineering Associate in Science degree in Electrical Trades which is intended for students who plan to transfer to a four-year institution. KVCC also has an Associate in Applied Science degree program in Electrical Technology, and a Certificate program which offers two options: Electrical Construction and Electrical Control.

Lansing Community College: This college offers an Associate in Applied Science degree in Electrical Technology, and two certificate programs: Electrical Construction and Electrical Control and Maintenance. Deana Hanieski, the Electrical Technology Department Head, reports that enrollment in these areas is "great". This college is engaged in a 2 + 2 program, mainly with Lake Superior State and Ferris State University, but very few students transfer.

Macomb Community College: This college offers three certificate programs in the following electrical areas: Construction Maintenance, Industrial Maintenance, and Mechanical Repair. Janet Yonosko, a counselor at MCC, indicated that most students in these programs are currently working, and are taking classes to better their occupational performance.

MCC also has the following Apprenticeship programs: Electrical Construction and Maintenance, Electrical-Mechanical Repair, and Electrician-Machine Tool. Floyd Brown, the Apprenticeship Coordinator at MCC, indicated that the Electrical Apprentice programs at MCC have good enrollment.

St. Clair County Community College: This college offers an Electrical/Industrial Certificate program, which is designed to upgrade skills or prepare the student for entry-level employment in troubleshooting industrial control circuitry.

Washtenaw Community College: This college offers two Electrical Associate Degree programs: Electrical Engineering Technology and Electrical Technology. Phil Mullins reported that the Engineering program is calculus based, and is designed for those students who plan to transfer to a four-year institution. WCC is engaged in the 2 + 2 program with the following colleges: Lawrence Tech, Ferris State, Central Michigan, and Eastern Michigan. They are working on developing connections with Purdue.

The Electrical Technology program is designed for those students who are trying to improve their current work skills, and for those who plan to pursue a technological career.

Wayne County Community College: WCCC offers a Certificate program in Electrical/Electronics Technology, with both a Computer Technology option and an Electrical Power Technology option. If a student wishes to earn an Associate of Applied Science, he/she must complete both the Certificate program and one of the two options.

Employer Survey Analysis

Skills

Employers were asked what they felt were the three most important technical skills necessary to be hired into their company. The responses varied considerably, however several of the employers indicated that a basic understanding of electricity was the most important factor. Additional important skills are as follows: mechanical knowledge and ability, knowledge of troubleshooting, blueprint reading, math skills, and common sense. A complete list appears in Appendix E.

Employers were also asked what skills they felt entry-level employees were lacking. Once again, there was a wide range of responses, however 30% (20) of those responding to this question indicated that experience was lacking, which appears to be obvious, since the question regarded entry-level skills. Additional skills lacking were

communication skills and motivation. For a complete list of responses to this question, please see Appendix F.

OCC Program

Employers were asked if they were aware of the Electrical Trades Technology Program at OCC. Forty-eight of the employers were asked this question, and fifteen of them indicated that they were aware of the program. Three of these fifteen employers indicated that they send their employees to OCC for training, while an additional three responded that they send their employees to other training institutions. The "other" colleges mentioned were Henry Ford Community College, ABC Technical School, and Schoolcraft College.

All employers were then asked if they had ever, to their recollection, hired an OCC graduate. Of the eighty-five employers surveyed, two of them could recall hiring an OCC graduate. Due to the small number of employers who had hired an OCC graduate, further analysis of this question is not possible.

Trends in the Future

Employers were asked what they felt the future trends in the electrical trades industry may be. Fifty-nine of the employers responded to this question. Twenty-seven of these employers felt that fiber optics would play a major role in the future of electrical trades. The following are examples of the responses given by employers: "more technical, cabling fiber optics"; "card-in access, fiber optics"; "more automation and electronic drives, electronic speed control, energy efficient management." Additional responses included an increasing use of robotics and computers. For a complete list of responses to this question, see Appendix F.

In the future, there is expected to be an increase in industrial expansion, electrical power, environmental protection, and energy production, which should lead to a greater need for electrical technicians (MOIS).

Opportunities for Working with OCC

OCC faculty members and advisory committee members are interested in working with employers to gain insight into the industry, and to help to provide students with opportunities to further their education and experience. When asked if they would be interested in sharing their expertise or ideas about the electrical technology industry, 30% (24 of 85) agreed that they would talk with a faculty or advisory committee member. In addition, 33% (27 of 85) responded that they would be interested in providing an OCC student with the opportunity for an internship or co-op at their company (See Table 6, Figure 6)(For a complete list, see Appendix C).

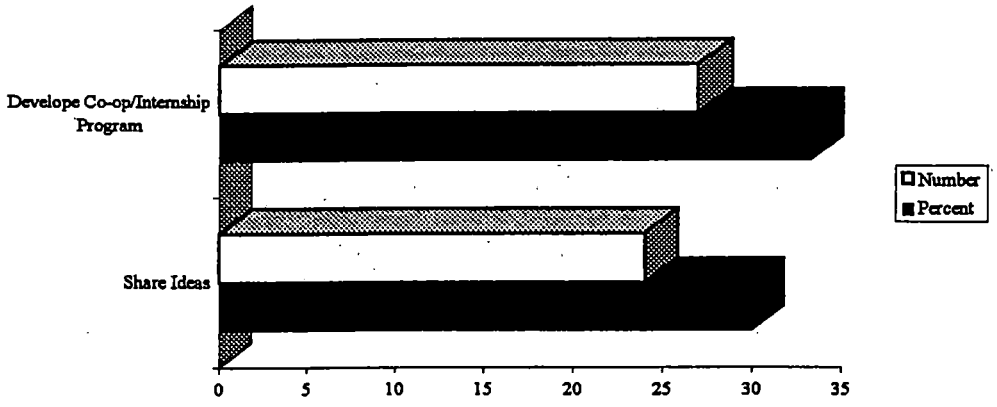
Table 6

Percentage of Employers who are Interested in Sharing Ideas and/or Developing Co-op/Intern Programs with OCC

Response	Percent	Number
Share Ideas	30	24
Develope Co-op/Internship Program	33.3	27
	63.3	51

Figure 6

Percentage of Employers who are Interested in Sharing Ideas and/or Developing Co-op/Intern Programs with OCC



Student Survey Analysis

Curriculum

Students who have enrolled in EEC courses in the past four semesters (Summer 1995 to Spring 1996) were surveyed, and 122 surveys were completed. Of these 122 students, 22 had taken ETT courses in addition to EEC courses. Although enrolling in EEC courses was a prerequisite to being surveyed, there were students from several curricula who were surveyed (See Table 7, Figure 7).

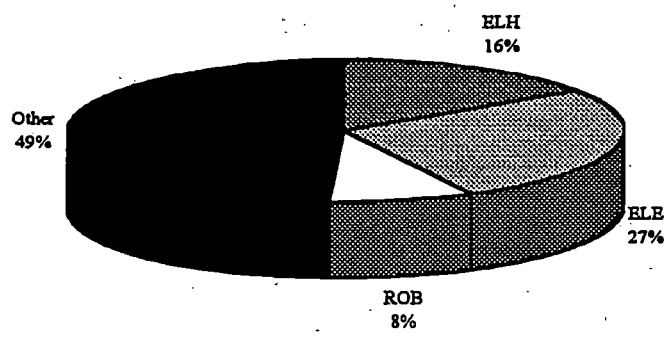
Table 7

Curriculum of Students Enrolled in EEC Courses

Curriculum	Number	Percent
ELH	19	16
ELE	33	27
ROB	10	8
Other	60	49
Total	122	100

Figure 7

Curriculum of Students Enrolled in EEC Courses



EEC courses are required for students in the following curricula (not including Restricted Programs): Electrical Trades Technology (ELH), Electronics Technology (ELE), and Robotics/Automated Systems Technology (ROB). However, as seen in the above table, students from "other" curricula such as (not a complete list of "other") Computer Aided Design (CAD), Computer Integrated Manufacturing Technology (CIM), Computer Information Systems (CIS), Machine Tool Technology-Numerical Control Option (NUM), and Welding and Fabricating Technology (ATW) are enrolling in EEC, and in some cases ETT, courses.

Transferring

The ELH program at OCC is designed so that a student may transfer into a 4-year program after completion of an AAS. Oakland Community College works with several colleges and universities in a 2 + 2 program, which allows the student to complete two years of study at OCC, then transfer into a 4-year degree program at the mid-point. We asked students about transfer information. The sample of OCC students surveyed provided only two students who have indeed transferred to a four-year institution, which is not a large enough sample to draw conclusions upon.

Philip Marcote, who is the Department Head of the Electrical/Electronics Engineering Technology program at Ferris State University, reported that they "do not get too many [transfer] students from OCC; we get more from Grand Rapids and Lansing...OCC students, that I can recall, have been adequately prepared, and OCC id doing a good job". Vicki McNiff, who is an admissions counselor at Lawrence Technological University, reported that their largest source of transfer students come from Macomb Community College and Henry Ford Community College, and that she is unsure of how many students from OCC transfer/have transferred into their program..

Employment Situation

Students were asked to report their current employment situation. A majority of the students (91 of 122, or 75.2%) were employed full-time at the time of the survey. Of the sixty-eight students who were still enrolled at OCC at the time of the survey, 58 (85%) were employed full-time, which suggests that they were probably taking evening classes (See Table 8, Figure 8). This also suggests that students may be taking classes as required by their employer, to advance in their current job, or to prepare for a new job. Survey analysis also indicates that there are more students who are currently enrolled at OCC and working full-time than there are students who are working full-time and not currently attending OCC. This means that a majority of OCC students who enroll in EEC courses work full time while attending school.

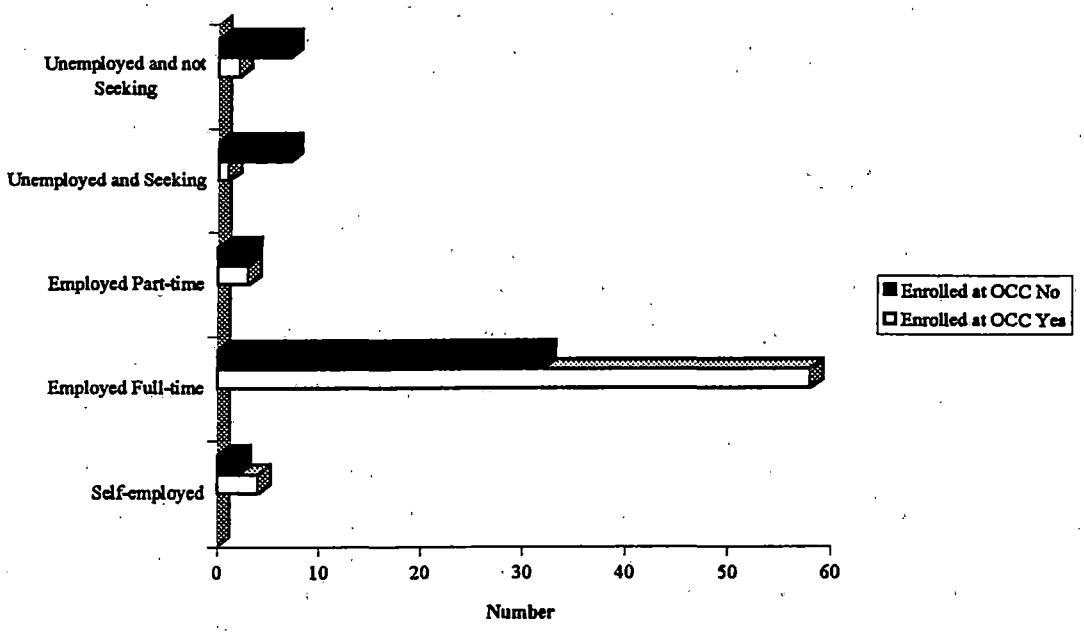
Table 8

Students Enrollment and Employment Status (In Numbers)

Employment Status	Enrolled at OCC	
	Yes	No
Self-employed	4	2
Employed Full-time	58	32
Employed Part-time	3	3
Unemployed and Seeking	1	7
Unemployed and not Seekin	2	7
Total	68	51

Figure 8

Students Enrollment and Employment Status



Students were asked which industry they worked in, and what their job titles were. Some of the industry types reported are as follows (For a complete list of responses, see Appendix G): automotive industry, framing, camera manufacturing, medical, electro-mechanical, and rubber industry. Job titles of the individuals surveyed also varied widely (For a complete list of responses, see Appendix G): robotics technician, mod technician, fluid designer, chemist assistant, traffic technician, and nuclear security. In addition to these questions, students were asked to list their top three job responsibilities. Once again, the responses varied widely, some of which are as follows (For a complete list of responses, see Appendix G): installation, maintain robots, testing, design new vehicles, debugging machines, soldering, pulling cable, and customer service.

In regard to their employment situation, students were asked to rate the relevancy of the skills and concepts that they received in EEC, and if applicable, ETT courses (See Table 9, Figure 9).

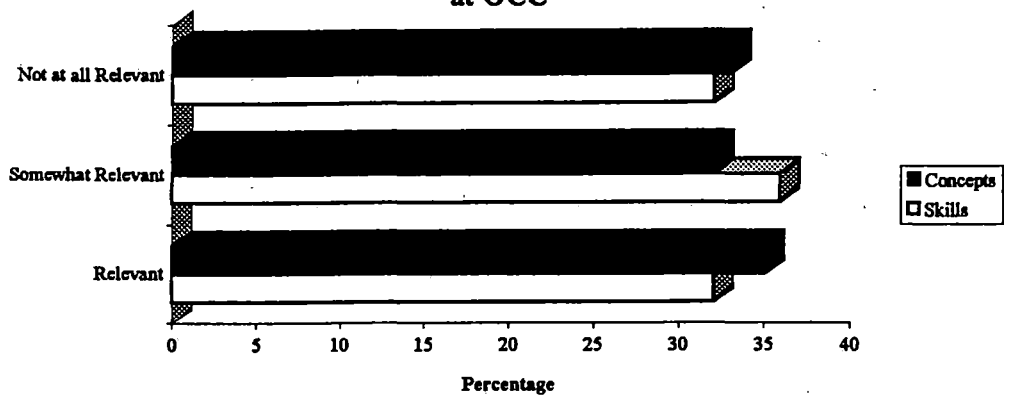
Table 9

Relevancy of Job Skills and Concepts Learned in EEC Courses at OCC

	Percent	
	Skills	*Concepts*
Relevant	32	35
Somewhat Relevan	35.9	32
Not at all Relevant	32	33
	99.9	100

Figure 9

Relevancy of Job Skills and Concepts Learned in EEC Courses at OCC



As can be seen from the above figure, students responses ranged evenly between relevant and not at all relevant for both job skills and job concepts obtained in EEC courses. Thirty-two percent of the students felt that the job skills that they learned in EEC courses at OCC were relevant to their job, while 32% felt that the skills were not at all relevant. In regard to job concepts, 35% felt that the concepts that they learned in EEC courses at OCC were relevant, while 33% percent felt that the concepts were not at all relevant.

There were a significantly lower number of responses in regard to ETT courses. However, of the twenty-two responding to this question, fifteen (68%) reported that the job concepts that they learned at OCC were relevant, while thirteen (59%) reported that the job skills obtained in their ETT courses were relevant.

Students were then asked what they liked about EEC courses, as well as what, if anything, could be done to improve the courses. Some of their responses are as follows: "problem-solving, analyzing the circuits"; "alternating circuits electronics"; and helped

with performing home wiring projects" (For a complete list of responses, see Appendix G). Several students indicated that they received a basic, overall, or complete understanding of electrical systems, which had been very helpful. Students also mentioned the helpful AC/DC skills that they learned at OCC. As for improving the EEC courses: "greater interface between college and automotive industry"; update electrical knowledge needed for future vehicles"; and more morning classes". In addition, students felt a need for more lab time, more equipment, and more hands-on experience (For a complete list of responses, see Appendix G).

Students were asked the same questions regarding ETT courses. There were fewer responses to these questions however, due to lower enrollment in the sample. Some of the students positive responses are as follows: "fundamentals of electronics"; three-phase, industrial/electronic"; and programming logic of electrical controls." Learning the "basics" about electrical controls and machines was important. In addition, some students mentioned the importance of wiring. To improve ETT courses, students suggested the following: "follow an established curriculum"; "relate courses to working in the field"; and should have prerequisites for college algebra, trig, and auto-CAD". Students also suggested more hands-on experience (For a complete list of responses, see Appendix F).

ELH faculty members are interested in knowing what students like or dislike about the program. As a part of the needs assessment, a question concerning the discussion of feelings about the program with faculty was asked. When questioned if they would be interested in sharing their thoughts with OCC faculty members, 36.6% of the students answered "Yes".

CONCLUSION

Overall, this report indicates that there is a growing need for electrical technicians nationwide and in Michigan. An increase in industrial expansion, electrical power, environmental protection, and energy production will provide a greater need for electrical technicians in the future. Employer responses indicate that fiber optics will be the trend in the field of electrical trades. When asked about important technical skills, a majority of the employers had a difficult time identifying these because they did not have sufficient time to think about them. Several employers did indicate that a basic understanding of electricity and/or a high school diploma were sufficient for obtaining an entry-level position as an electrical technician. The insufficient amount of technical skills reported indicates the possible need for faculty or advisory committee members to conduct personal, one-on-one interviews or focus groups, with some of the employers, to determine additional skills.

Students indicated a positive attitude toward both EEC and ETT courses. The majority felt that they were gaining adequate skills in the classes. However, students did indicate a need for more lab time and hands-on experience.

BIBLIOGRAPHY

Brown, Floyd (July, 1996). Telephone interview. Applied Technology Department Apprenticeship Coordinator at Macomb Community College.

Discover. 1996. Computer generated information.

Halapir, June (June, 1996). Telephone interview. Enrollment Systems at Wayne State University.

Hanieski, Deana (July, 1996). Telephone interview. Electrical Technology Department head at Lansing Community College.

Leibel, Charles (July, 1996). Telephone interview. Technical Recruiter at Aerotech Automotive Engineering Services.

McNiff, Vicki (June, 1996). Telephone interview. Admissions Counselor at Lawrence Technological University.

Macushik, Steve (July, 1996). Telephone interview. Electrician Superintendent at the Oakland County Road Commission Traffic Safety Department.

Marcotte, Philip (June, 1996). Telephone interview. Electrical/Electronic Engineering Department Head at Ferris State University.

Michigan Occupational Information System (MOIS). 1995-1996. Computer generated information.

Mullins, Phil (July, 1996). Telephone interview. Electrical Engineering Technology faculty at Wastenaw Community College.

Oakland Community College (1996-1997). College Catalog.

Schwartz, John (July, 1996). Telephone interview. Facilities Management at William Beaumont Hospital.

APPENDIX A

Electrical Trades Technology (ELH)

Program Description

Electrical Trades Technology (ELH)

Auburn Hills

Associate in Applied Science

The Electrical Trades Technology Program is an Associate Degree program in Applied Science, preparing the student for job entry into any of the various occupations related to electricity and/or industrial electricity. In addition to the required courses, the student may choose from a variety of electives to suit his/her individual career plan.

Major Requirements			Credits
EEC	102*	DC Fundamentals	3
EEC	104*	AC Fundamentals	3
EEC	105*	DC and AC- Circuit Analysis	3
EEC	127*	Basic Electronics	3
EEC	135*	Digital Logic	3
ETT	111*	Industrial Electrical Systems	3
ETT	250*	Electrical Machines	4
ETT	270*	Machines and Process Control	4

Required Supportive Courses

MAT	115★	Intermediate Algebra	4
APP	815	Applied Technology I	2
APP	816	Applied Technology II	2
DDT	100	Fundamentals for the Drafting Industry	3

General Education Requirements

See graduation requirements for an Associate in Applied Science Degree on pages 47, 48, 49 and 50.

Necessary Electives to Total ..... 62 Credits

TECH PREP STUDENTS

Those students who have completed articulated Electronics TECH PREP programs within the country, may apply for Advanced Placement by passing the appropriate S.E.L.E.C.T. (Student Entry Level Electronics Competency Test) test at the college. Detailed information may be obtained through your high school counselor.

*When all courses marked with an asterisk are completed, the student may apply for a Certificate.

★General Education courses listed as Required Supportive may be used to meet requirements of the General Education component.

Appendix B

Classification of Instructional Programs

(C.I.P. Codes)

Classification of Instructional Programs

(C.I.P. Codes)

15.0303 ***Electrical, Electronic and Communications Engineering Technology/Technician:***
An instructional program that prepares individuals to apply basic engineering principles and technical skills in support of electrical, electronics and communication engineers. Includes instruction in electrical circuitry, prototype development and testing; systems analysis and testing, systems maintenance. instrument calibration, and report preparation.

15.0399 ***Electrical and Electronic Engineering-Related Technologies/Technicians, Other:***
Any instructional program in electrical and electronic engineering-related technologies not described above.

15.0403 ***Electromechanical Technology/Technician:*** An instructional program that prepares individuals to apply basic engineering principles and technical skills in support of engineers engaged in developing and testing automated, servomechanical, and other electromechanical systems. Includes instruction in prototype testing, manufacturing and operational testing, systems analysis and maintenance procedures, and report preparation.

15.1101 ***Engineering Technology/Technician, General:***
An instructional program that generally prepares individuals to apply basic engineering principles and technical skills in support of engineers engaged in a wide variety of projects. Includes instruction in various engineering support functions for research, production, and operations, and applications to specific engineering specialties.

47.0105 ***Industrial Electronics Installers and Repairer:***
An instructional program that prepares individuals to apply technical knowledge and skills to assemble, install, operate, maintain, and repair electrical/electronic equipment used in industry and manufacturing. Includes instruction in installing, maintaining and testing various types of equipment.

Appendix C

Electrical Trades Technology
Employer List

ELH
Employer Survey List of Contacts

Italics:Interested in sharing ideas with faculty members or advisors
Bold: Intersted in giving an OCC student the opportunity to work in a co-op or internship program

Rite Electric Co Inc. Of Berkley
3060 W 11 Mile Rd.
Berkley, MI 48072
810-548-4200

Dunn Electric Co Inc.
30400 Telegraph Rd., Ste. 364
Birmingham, MI 48009
810-647-0500

Koch & White Heating & Cooling Inc
2608 W Liberty St.
Ann Arbor, MI 48103
313-663-2416

Thalner Electronic Laboratories Inc.
7235 Jackson Ave.
Ann Arbor, MI 48103
313-761-4506

Center Line Electric Inc.
26554 Lawrence Ave.
Center Line, MI 48015
810-757-5505

Control One Inc.
24290 Sherwood Ave.
Center Line, MI 48015
810-756-2810

Joe Pizik Electric Inc.
724 N Rochester Rd.
Clawson, MI 48017
810-588-4010

Act Now Alarm Services Inc.
20874 Colman St.
Clinton Township, MI 48035
810-792-9226

Elite Communications Inc.
21005 Farmington Rd.
Farmington Hills,. MI 48336
810-474-7020

Guardian Electric Company Inc.
831 E. Lewiston Ave.
Ferndale, MI 48220
810-399-3060

McMurray Electric Inc.
22036 Woodward Ave.
Ferndale, MI 48220
810-541-5900

Markee Electric Inc.
2410 Kansas Ave.
Flint, MI 48506
810-767-4070

Marv's Electric Company Inc.
G3347 Richfield Rd.
Flint, MI 48506
810-736-2790

Newkirk Electric Associates Inc.
2751 Lippincott Blvd.
Flint, MI 48507
810-742-4400

Weinstein Electric Company Inc.
213 W 1st Ave.
Flint, MI 48503
810-232-5934

Rutkofske-Neal Inc.
34195 Riviera Dr.
Fraser, MI 48026
810-293-6040

Audio Communications Inc.
12933 Farmington Rd.
Livonia, MI 48150
313-522-2910

Brinks Home Security Inc.
11908 Farmington Rd.
Livonia, Mi 48150
313-422-0707

Gillis Electric Inc.
34133 Schoolcraft Rd.
Livonia, MI 48150
313-425-1011

McGraw Electric Company of Michigan Inc.
12201 Merriman Rd.
Livonia, MI 48150
313-525-2510

Multi-Communications Systems & Service Inc.
30731 8 Mile Rd.
Livonia, MI 48152
810-478-5256

Shaw Electric Company Inc.
33200 Schoolcraft Rd.
Livonia, MI 48150
313-425-6800

United Temperature Services Inc.
8919 Middlebelt Rd.
Livonia, MI 48150
313-525-1930

Labelle Electric Inc.
24546 21 Mile Rd.
Macomb, MI 48042
810-468-5252

Edgewood Electric Inc.
26600 John R Rd.
Madison Hts., MI 48071
810-542-6060

Johnson Controls Network Integration Services Inc.
31789 John R Rd.
Madison Hts., MI 48071
810-583-3050

Traingle Electric Company Inc.
29787 Stephenson Hwy.
Madison Hts., MI 48071
810-399-2200

McRea Electric Co Inc.
19720 Gerald St.
Northville, MI 48167
810-349-4424

MTI Energy Management In Lighting Inc.
39562 Grand River Ave.
Novi, MI 48375
810-478-2737

J Hale Electrical
16623 Plymouth Rd.
Detroit, MI 48227
313-835-3188

Electrical Technical Services
31097 Schoolcraft Rd.
Livonia, MI 48150
313-422-4910

Electric Motor Service
384 N Saginaw St.
Pontiac, MI 48342
810-334-3981

George Shrokman & Assoc.
6600 Highland Rd., #20
Waterford, MI 48327
810-666-1111

TNE Corp
51400 County Line Rd.
New Baltimore, MI 48047
810-725-3010

Metering Technologies LTD.
28820 Southfield Rd.
Southfield, MI 48076
810-559-2330

Madison Electric
3900 Jackson Rd
Ann Arbor, MI 48103
313 665-6131

Newport Electric Inc.
P.O. Box 167
Newport, MI 48166
313 586-2208

North End Electric Co.
2000 Bellaire Rd
Royal Oak, MI 48067
810 398-8187

Michigan Motor Works
10092 Colonial Industrial Dr
South Lyon, MI 48178
810 437-2722

Royce Electric Co.
22935 E Industrial Drive
St. Clair Shores, MI 48080
810 779-3500

Quasar Industries
2687 Commerce Drive
Rochester, MI 48309
810 852-0300

Dynex Industries
23460 Industrial Park Dr
Farmington Hills, MI 48335
810 477-6066

All in One Electric
13181 Orange Street
Southgate, MI 48195
313 281-1703

Arbor Vacuum and Appliance Center
1226 Packard St
Ann Arbor, MI 48104
313 761-3677

Sorg Electric Repair Co
8589 N Lilley Road
Canton, MI 48187
313 454-5728

Intercity Appliances Inc
26450 Van Dyke Ave
Center Line , MI 48015
810 757-4443

D&R Repair Center
3335 Hilton Rd
Ferndale, MI 48220
810 547-9620

Foamade Industries
Auburn Hills, MI 48326
810-852-6010, ext. 229

Hawthorne Metal Products Co.
Royal Oak, MI 48073
810-549-3800

Oakland County Road Commission, Traffic Safety Dept.
Waterford, MI 48328
810-858-4871

Venus Control Inc.
Livonia, MI
810-477-6520

Mer-O-Tronics Instrument
Almont, MI
810-798-8555

Automation Inc.
Ann Arbor, MI 48108
313-662-7771

Electrical Specialists
Redford, MI 48239
313-534-8333

G&S Electric Co.
Troy, MI 48083
810-585-8900

Alpha Electric Inc.
Sterling Hts., MI 48314
810-977-3800

Tri-County Electric
Saline, MI 48176
313-429-4711

Harlan Electric Co.
Southfield, MI 48034
810-353-8660

Automated Energy
Southfield, MI 48034
810-356-7738

Rauhorn Electric Inc.
Shelby Twp., MI 48315
810-739-8400

Jembo Corporation
St. Clair Shores, MI 48080
810-779-6500

BSB Communications
St. Clair Shores, MI 48080
810-774-6000

McSweeney Electric Inc.
Novi, MI 48375
810-349-4899

Begley Enterprises Inc.
Oak Park, MI 48237
810-967-2010

Hall Engineering Co.
Redford, MI 48239
313-255-2800

Industrial Temperature Control
Dearborn, MI 48128
313-278-2210

Deco-Grand Inc.
Royal Oak, MI 48073-1023
810-435-0100

Cannon Electric Co.
Roseville, MI
810-296-6200

Munro Electric Co.
Wixom, MI 48393
810-344-9990

Novi Technologies Group
West Bloomfield, MI 48325
810-683-0003

New Castle Electric Co.
Clinton Twp., MI 48035
810-791-7400

Williams
Warren, MI 48093
810-758-2020

Rowe Electric Co.
Wayne, MI 48184
313-721-4080

GE Supply
Troy, MI 48083
810-588-7300

Arrow Motor & Pump
Trenton, MI 48183
313-285-5700

Sadler Electric
St. Clair Shores, MI 48081
810-775-7144

Regulars Corp.
Troy, MI 48083
810-689-1000

Cabling Concepts Inc.
4214 Martin Rd.
Commerce Twp., MI 48390
810-363-4200

RB & Sons Inc.
Troy, MI 48083
810-524-1630

Dana Corp.
Warren, MI 48089
810-758-5000

Help Engineering
Troy, MI 48083
810-585-9390

North Bay Electric Inc.
Utica, MI 48315
810-781-2793

Q & B Associates
Troy, MI 48084
810-362-1380

Kempco Electric
Walled Lake, MI 48390
810-360-0700

Craig EDM
20733 Sunnydale St.
Farmington Hills, MI 48336
810 474-4220

Appendix D

Electrical Trades Technology
Employer Survey

Oakland Community College
Electrical Trades Technology
Employer Survey
August, 1996

Name:_____

Title:_____

Business:_____

City/Zip:_____

Phone: _____

We are conducting a needs assessment on the Electrical Trades Technology program at Oakland Community College, and would value your expertise and opinions. Do you have a few minutes to answer some questions for us?

1. Do you have employees in the area of Electrical Technology?
   1 _____ Yes
   0 _____ No ***(Terminate survey)***

2. Could you please tell me which of the following job titles most accurately describe those used for employees at your company? ***(Circle all that apply):***

	Yes	*No*
Electrical Technician	1	0
Electrician/Maintenance	1	0
Robotics Technician	1	0
Electrician/Machine Repair	1	0
Panel Wire Person	1	0
Electrician/Industrial	1	0
Electromechanical Technician	1	0
Electromechanical Assembler	1	0

Other ***(Please be specific):***_____

_____

3. What is the minimal level of education that your company requires for an entry-level position in the area of Electrical Technology? ***(Check one only)***

1 _____ No specific educational requirement
2 _____ High school diploma, or equivalent
3 _____ Certification
4 _____ Associate degree
5 _____ Bachelor degree
6 _____ Specific training, only

Other ***(please be specific):*** _____

_____

4. In regards to the **entry-level electrical technology** employees at your company, could you please tell me what you feel are the three most important **technical** skills necessary to be hired?

A) _____

B) _____

C) _____

5. Which skills do you find **entry-level** employees are most lacking? ***(Please be specific):***

_____

_____

Now I would like to ask a few questions about employee training.

6. Do you provide training for your employees?

1 _____ Yes
0 _____ No ***(Skip to Question #12)***
9 _____ *No Response* ***(Skip to Question #12)***

7. Which of the following best describes the training you provide?

1 _____ On-site, conducted by company employees
2 _____ On-site, conducted by outside experts in the field
3 _____ Off-site, conducted by company employees
4 _____ Off-site, conducted by outside experts in the field

Other ***(Please be specific):*** _____

8. Are you aware of OCC's Electrical Trades Technology program?
   1 _____ Yes
   0 _____ No *(Skip to Question #15)*
   9 _____ *No Response (Skip to Question #15)*

9. Does your company send employees to Oakland Community College, or to any other two or four year institutions for training?
   1 _____ Yes, to OCC
   2 _____ Yes, to another *(Skip to Question #12) If "Yes", which one(s)?* _____

   _____

   0 _____ No *(Skip to Question #12)*
   9 _____ *No Response (Skip to Question #12)*

10. After training, do you feel that the employee you sent to OCC was **Adequately Prepared, Somewhat Prepared**, or **Not at all Prepared**?
   0 _____ Adequately Prepared *(Skip to Question #12)*
   1 _____ Somewhat Prepared
   2 _____ Not at all Prepared
   9 _____ *No Response (Skip to Question #12)*

11. Could you please tell me specifically what skills you felt were lacking? *(Please be specific):*

    _____

    _____

    _____

Now, I'd like to ask you a few specific questions regarding OCC **graduates**.

12. Have you ever, to your knowledge, hired a **graduate** from the Electrical Trades Technology program at OCC?
   1 _____ Yes
   0 _____ No *(Skip to Question #15)*
   7 _____ Don't Know *(Skip to Question #15)*
   9 _____ *No Response (Skip to Question #15)*

13. Do you feel, in regards to **technical** entry-level skills, that the OCC student was **Adequately Prepared, Somewhat Prepared**, or **Not at all Prepared?**
   0 _____ Adequately Prepared *(Skip to Question #15)*
   1 _____ Somewhat Prepared
   2 _____ Not at all Prepared
   9 _____ *No Response (Skip to Question #15)*

14. Could you please tell me specifically what **technical** skills you felt were lacking? ***(Please be specific):*** _____

_____

_____

I'd also like to ask you, in general, about the salary of Electrical Technology employees.

15. In terms of salary, could you please tell me the average entry-level earnings of electrical technology employees in your company? ***(Interviewer: Please confirm whether this is hourly, weekly, or yearly):*** _____

Now, I would like you to think about the future of electrical trades. We are interested in understanding the ways in which the field might change in the next 5-10 years, and value your opinion.

16. Could you please tell me what trends you foresee in the future of Electrical Trades Technology? ***(Interviewer: Probe for specifics, i.e. more fiber optics, robotics, computers):***

_____

_____

17. Would you be interested in sharing your expertise or ideas about the industry with an OCC faculty member or advisor?
    1 _____ Yes
    0 _____ No
    9 _____ *No Response*

18. Would you be interested in giving an OCC student the opportunity to work in a co-op or internship program at your company?
    1 _____ Yes
    0 _____ No
    9 _____ *No Response*

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

Interviewer Signature:_____ ***Date:***_____

Appendix E

Electrical Trades Technology
Student Survey

Oakland Community College

Electrical Trades Technology

Student Survey

July, 1996

Note: If the phone label <u>DOES NOT</u> indicate that they have taken courses in <u>BOTH</u> EEC and ETT, do not ask the questions with the * next to them!!!!

We are evaluating the Electrical Trades Technology program at OCC, and are interested in comments about your experience at OCC. Do you have a few minutes to answer some brief questions? ***(If "No", discontinue the survey).***

1. Could you please tell me if you are currently taking classes at OCC?
   1 _____ Yes ***(Skip to Question #6)***
   0 _____ No
   9 _____ *No Response* ***(Skip to Question #6)***

2. Since leaving OCC, have you ***(Check all that apply)***:
   1 _____ Transferred to a four-year institution
   2 _____ Found a job related to your field of study ***(Skip to Question #6)***
   3 _____ Found a job in a field unrelated to your area of study ***(Skip to Question #6)***
   8 _____ Other: ***(Skip to Question #6)*** _____

   _____

3. Could you please tell me which college you transferred to? _____

   _____

   And, which program did you enroll in? _____

4a. In regards to your transfer, could you please tell me if the concepts focused on in your EEC courses were **Relevant, Somewhat Relevant,** or **Not at all Relevant**?
   0 _____ Relevant
   1 _____ Somewhat Relevant
   2 _____ Not at all Relevant
   9 _____ *No Response*

b. In regards to your transfer, could you please tell me if the skills taught in your EEC courses were **Relevant, Somewhat Relevant,** or **Not at all Relevant**?

0 _____ Relevant
1 _____ Somewhat Relevant
2 _____ Not at all Relevant
9 _____ *No Response*

Now I would like to ask you some similar questions, but could you please focus now on you ETT courses?

*5a. In regards to your transfer, could you please tell me if the concepts focused on in your ETT courses were **Relevant, Somewhat Relevant,** or **Not at all Relevant**?

0 _____ Relevant
1 _____ Somewhat Relevant
2 _____ Not at all Relevant
9 _____ *No Response*

* b. In regards to your transfer, could you please tell me if the skills taught in your ETT courses were **Relevant, Somewhat Relevant,** or **Not at all Relevant**?

0 _____ Relevant
1 _____ Somewhat Relevant
2 _____ Not at all Relevant
9 _____ *No Response*

6. We would like to know a bit about your employment situation. Are you:

0 _____ Self employed
1 _____ Employed full-time (40+ hours per week)
2 _____ Employed part-time (Less than 40 hours per week)
3 _____ Unemployed and actively seeking employment ***(Skip to Question #11)***
4 _____ Unemployed and not seeking employment ***(Skip to Question #11)***
9 _____ *No response* ***(Skip to Question #11)***

7. Can you tell me what industry, or field of work, you are employed in?

_____

8a. What is your current occupation/job title? _____

b. Could you please tell me what your three top job responsibilities are?

1)_____

2)_____

3)_____

9a. In regards to your current job, could you please tell me if the concepts focused on in your EEC courses were **Relevant, Somewhat Relevant,** or **Not at all Relevant?**

0 _____ Relevant
1 _____ Somewhat Relevant
2 _____ Not at all Relevant
9 _____ *No Response*

b. In regards to your current job, could you please tell me if the skills taught in your EEC courses were **Relevant, Somewhat Relevant,** or **Not at all Relevant?**

0 _____ Relevant
1 _____ Somewhat Relevant
2 _____ Not at all Relevant
9 _____ *No Response*

*10a. In regards to your current job, could you please tell me if the concepts focused on in your ETT courses was **Relevant, Somewhat Relevant,** or **Not at all Relevant?**

0 _____ Relevant
1 _____ Somewhat Relevant
2 _____ Not at all Relevant
9 _____ *No Response*

* b. In regards to your current job, could you please tell me if the skills taught in your ETT courses were **Relevant, Somewhat Relevant,** or **Not at all Relevant?**

0 _____ Relevant
1 _____ Somewhat Relevant
2 _____ Not at all Relevant
9 _____ *No Response*

11. Could you please tell me what you liked about the EEC courses? ***(Interviewer, please ask them to be specific about their responses)*** _____

_____

_____

12. Could you please tell me what you think could be done to improve the EEC courses? ***(Interviewer, please ask them to be specific about their responses)*** _____

*13. Could you please tell me what you liked about the ETT courses? ***(Interviewer, please ask them to be specific about their responses)*** _____

_____

_____

*14. Could you please tell me what you think could be done to improve the ETT courses? ***(Interviewer, please ask them to be specific about their responses)*** _____

_____

_____

15. Would you be interested in talking to an OCC faculty member to share any ideas?
   1 _____ Yes
   0 _____ No
   9 _____ *No Response*

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

Interviewer Signature: _____ *Date:* _____

Appendix F

Electrical Trades Technology
Employer Survey
Narrative Responses

Employer Survey Narrative Responses

Job Titles ("other")

1. Low voltage wiring person for cable, telephones, alarms, etc.
2. Installer of lighting fixtures
3. HVAC machinery technicians, residential electrician
4. Construction electrician
5. Applications engineer
6. Electrical engineers
7. Residential electrician
8. Electrical assembly
9. Construction electrician
10. Union employees
11. All types of technicians
12. Assistant to electrician, apprentice
13. Data communications wiring
14. Apprentices, journeyman, master electrician
15. Alarm installers, alarm technicians, alarm serviceman
16. Apprentice
17. Apprentice, journeyman
18. Alarm installers
19. Electronic service technician
20. Electronic technician
21. Electrical construction
22. Electrical construction
23. General electrician

"Other" responses to minimal level of education necessary

1. Union only
2. Journeyman, union only
3. Apprentice, union only
4. Some electrical training (enough to pass a mechanical/electrical test) and one year of industrial experience
5. Some college....the more the better
6. Working on an Associate or Bachelor degree at time of employment
7. Co-op and ITT
8. 4-year apprenticeship
9. Union only
10. Union only
11. Union only

12. Union only
13. Union only
14. Union only
15. Union only
16. 4 years of trade school
17. 2 years of vocational school, or equivalent experience
18. 1-2 years of trade school
19. 2 years of trade school
20. 2 years of experience
21. 1 year of algebra
22. Union only
23. Union only

Technical skills necessary for entry-level employment

1. Union standards
2. On the job training, journeyman, apprenticeship
3. Anything related to electrical plugs, lights, ceiling fans, circuits, etc.
4. Union standards
5. Knowledge of electrical wiring, communication skills
6. Knowledge of electricity, communication skills, common sense
7. Union standards
8. Putting pieces together, working on ladders, mechanical knowledge
9. Understanding of electrical trades, proficiency in what you're doing, AC/DC
10. Ability to work with other people, knowledge of equipment, electrical ability
11. Mechanical ability, work conscientiousness, willingness to learn
12. Basics of electricity, hand tools
13. Union standards
14. Assembly skills, wiring skills, reading skills
15. Knowledge of the electrical field, ability to work with others
16. Construction knowledge, electrical licensing
17. Basic electrical knowledge, electrical blueprint reading, automation expertise
18. Good motor functions, mechanical abilities, common sense
19. Basic math (shop math), electrical circuits (AC/DC), general machines
20. AC/DC skills, common sense, basic mechanical knowledge
21. Schematic reading, instrumentation (understanding meters), good mechanical ability
22. Common sense, ability to reason, good work habits
23. Good understanding of basic electricity, mechanical ability
24. Mechanically inclined, literate
25. Common sense, knowledge of transformers, knowledge of switch gears
26. Knowledge of electric parts, common sense, knowledge of basic electrical skills
27. At least 1 year experience in panel wiring, blueprint reading, panel layouts
28. Knowledge of troubleshooting, eagerness to learn, grasp on electrical concepts

29. Mechanical ability, good communications
30. Basic electricity, mechanical ingenuity, customer relations
31. Troubleshooting, schematic reading, computer knowledge
32. Familiarity with the Electrical Code, understanding of materials, understanding of the usage of tools
33. Knowledge of installing conduit and wiring, punctuality
34. Ability to read and understand wiring diagrams
35. Know all areas of electrical work, state code, troubleshooting
36. Troubleshooting, basic wiring, common sense
37. Math background, mechanical aptitude
38. Knowledge of the craft, heavy duty wiring, restoring power sources
39. State code, Ohms Law, basic wiring and conduit
40. Electrical knowledge and experience
41. Electrical theory, code, basic mechanics
42. Knowledge of electrical work, wires, safety elements
43. Knowledge of wiring, materials
44. Union standards
45. Basic electronics, troubleshooting, communication skills
46. Troubleshooting, cables, computers
47. AC/DC, motor knowledge, wiring, voltage
48. Control circuits, wiring and power wiring
49. Union standards, basic knowledge in electronics
50. Maintenance, circuitry, common sense
51. Desire to learn
52. Circuits, tools
53. Safety, quality workmanship, attitude
54. Mechanically inclined, ability to learn easily
55. Certification, electrical controls, circuitry, blueprint reading
56. Trade background, bench experience, customer relations
57. Understanding of electricity, salesmanship, communication skills
58. Troubleshooting, blueprint reading, logical thinking
59. Knowledge of electricity and electronics, mechanical skills
60. Shop-type attitude, mechanical knowledge, electrical knowledge
61. Neatness, open-minded, flexibility
62. Communication, productivity, knowledge
63. Math skills, mechanical skills, good attitude
64. Hands-on experience, blueprint reading, self-motivated
65. Performance, motivation, knowledge
66. Knowledge ,experience, responsibility
67. Common sense, motivation
68. Solid understanding of all electricity, machinery, AC/DC principles
69. Bend conduit, know circuitry and mechanics
70. Knowledge in all electrical fields, common sense, ability to communicate well

71. Knowledge of wiring, fiber optic skills, telecommunication training
72. Knowledge of basic wiring, mechanically inclined, motivated
73. Initiative and motivation, writing and communication skills, knowledge of the business
74. Work experience, education, ability to work with others
75. Common sense, troubleshooting, ability to work well with others
76. High learning capacity, good working habits, basic electrical knowledge
77. Union standards

Which skills are entry-level employees lacking?

1. Experience in general
2. Basic knowledge
3. Experience
4. Communication skills
5. Motivation, ability to concentrate
6. Communication skills
7. Motivation
8. Good work habits and customer relations
9. Experience
10. Wiring
11. Experience
12. Automation
13. Reading and writing skills
14. Math and circuits (AC/DC)
15. Instrumentation and schematic reading
16. Good work ethic
17. Math skills
18. Ability to follow procedures and directions
19. Experience on the job
20. Common sense
21. Experience
22. Troubleshooting with common sense
23. Work ethic
24. Basic electricity
25. Work ethic and company loyalty
26. Understanding of materials
27. Punctuality
28. Patience
29. Communication skills and customer relations
30. Communication and basic knowledge
31. Basics or installation
32. Experience

33. Basic experience and communication
34. Experience
35. Motivation and experience
36. Ambition
37. Experience
38. Experience
39. Experience
40. Communication and experience
41. Communication
42. Spelling and communication
43. Electrical circuitry
44. Knowledge of circuits and tools
45. Quality workmanship
46. Common sense
47. Controls and diagnostic skills
48. Customer service
49. Logical thinking
50. Ambition, willingness to work
51. Reliability
52. Math skills
53. Blueprint reading
54. Experience
55. Communication skills
56. Experience
57. Hands-on experience
58. Communication skills, basic knowledge
59. Mechanical ability
60. General knowledge in the field
61. Communication skills
62. General knowledge
63. Education and hands-on experience
64. Hands-on experience
65. Motivation
66. Skills and experience

"Other" colleges that employees are sent to:

1. Henry Ford Community College
2. ABC Technical School, Schoolcraft College
3. 4-year Technical School (don't know the name)

Entry-level earnings of employees:

1. $28.00+
2. $12.00
3. $8.00+
4. $8.90+
5. $30,000+/yr.
6. $26,000/yr.
7. Union scale
8. $8.50
9. Varies
10. $16.00
11. $7.00+
12. $15.00
13. $8.92
14. $6.50
15. $8.00
16. $50,000/yr. if licensed electrical technician
17. $7.50
18. $8.00
19. $9.00
20. $20.00
21. $10.00
22. $14.00
23. $14.00
24. $16,400/yr.
25. $10.00
26. $7.00
27. $6.50
28. $4.65
29. $8.50
30. $5.00 to $10.00 depending on experience
31. $10.00 to $12.00
32. $13.50
33. $10.00 to $12.00
34. $7.00
35. 30% of journeyman scale
36. 30% of journeyman scale
37. $12.00+
38. $8.40
39. $8.00
40. $12.00
41. $7.80

42. $7.50 to $8.00
43. $10.00
44. $8.93
45. $8.65
46. $20,000/yr.
47. $8.00 to $9.00
48. $30,000/yr.
49. $12.00
50. $8.00
51. $9.00 (out of high school), $15.00 with experience
52. $7.00 to $8.00
53. $7.00
54. $25.00
55. $7.50
56. $8.00
57. $9.00 to $12.00
58. $25,000/yr.
59. $13.00 to $14.00
60. $5.00
61. $10.00 to $13.00
62. $8.00 tp $9.00
63. $18,000/yr.
64. Apprentices $8.67 to $25.90
65. $9.00
66. $7.50
67. $7.00 to $10.00
68. $8.00
69. $8.00
70. $7.50+
71. $28,000/yr.
72. 35% of journeyman scale
73. $7.00 to $9.00
74. $8.00 to $10.00
75. $8.00
76. $8.00 to $9.00
77. $25,000/yr.
78. $8.00 to $10.00
79. $8.00 to $10.00
80. Union scale

Trends in the future of Electrical Trades Technology:

1. Fiber optics
2. More technical, cabling fiber optics
3. Fiber optics, robotics
4. Fiber optics
5. Fiber optics
6. Great field for women to go into now
7. Fiber optics is the next step in electrical efficiency
8. Card-in access, fiber optics
9. Cheaper products, more solid state controls
10. More electricians
11. Fiber optic power
12. PC based automation
13. A lot more plastics in the following: phones, computers, communications
14. More automation and electronic drives, electronic speed control, energy efficient management
15. More sophisticated controls
16. More technical as far as control work, more computer-oriented
17. More emphasis on programmable logic controllers and troubleshooting
18. Bright future, growing field. Increasing use of automation, more electronically controlled PCS
19. More computers
20. Computers and fiber optics
21. Employees need to be diversified.....robotics and fiber optics
22. Specialized training, brushless control theory
23. More technology and computers
24. Change in EPA rules and energy rules, downsizing, more computers
25. More computers
26. More electronic control devices, radio signals, and lasers
27. Fiber optics, telecommunications
28. More computers and fiber optics
29. Fiber optics
30. Major expansions and greater needs
31. Fiber optics
32. Fiber optics
33. Fiber optics
34. On-going growth
35. The entire field is growing
36. Fiber optics in our line of work
37. Definitely robotics
38. More computer technology
39. More computers and fiber optics

40. A growth in the use of fiber optics
41. More fiber optics
42. Fiber optics, robotics, computers
43. Robotics and computers
44. A greater need for more electrical people
45. A lot more data transmission lines, category 5 cabling, and fiber optics. Also, more PLC based operations, whereas before it was all control panels
46. Area of digital control
47. Computers
48. Digital tape storage and digital video recordings
49. Technology is eliminating the need for electrical repair people
50. More computers
51. More technical, fiber optics, a computer background will be necessary especially for electricians in shops
52. Smaller firms, variety increase
53. More technical, more hands-on, and an increasing use of computers
54. Big changes are ahead
55. More highly efficient things
56. Use of cables, computer systems, and fiber optics are developing
57. More fiber optics
58. Fiber optics, and high-speed data communication systems (i.e., cable and T.V.)
59. Fiber optics

Appendix G

Electrical Trades Technology
Student Survey
Narrative Responses

Student Survey Narrative Responses

What have you done since leaving OCC? ("other" responses)

1. Gotten GED
2. Entered military service
3. Waiting for finances to improve to take more classes
4. Just taking the summer off
5. Taking summer off
6. Taking summer off
7. Taking summer off
8. Returning in fall
9. Taking summer off
10. Returning in fall
11. Returning in fall
12. Returned to the job that I already had
13. Had to drop out for family reasons
14. On vacation until the fall
15. Returned to a job that I already had
16. Going into the Army on August 1st
17. Taking time off
18. ETT 111 or ECT 127 aren't offered until winter
19. Took the summer off; coming back int he fall
20. Will continue with classes in the fall

What college have you transferred to?

1. Oakland University
2. Oakland University

Which program did you enroll in?

1. Computer science
2. English

What industry or field are you employed in?

1. Automotive
2. Music instruction
3. Training and education
4. Robotics

5. Government
6. Auto repair
7. Technical
8. Manufacturing
9. Electrical engineering
10. Electrical
11. Automotive
12. Automotive
13. Computer
14. Computers
15. Communications
16. Communications
17. Electro-mechanical
18. Engineering service
19. Electronics
20. Phone
21. Medical
22. Manufacturing
23. Electronics
24. Automotive electronics
25. Retail
26. Framing
27. Industrial
28. County employee
29. Food service
30. Marketing consultant
31. Tool and die
32. Mechanics
33. Valet
34. Production
35. Road commission
36. Pharmacy
37. Automotive electrician
38. Automotive
39. Electrical
40. Electrical
41. Machine tool
42. Electronics
43. Industrial contracting
44. Engineering
45. Photo finishing
46. Automotive
47. Government

48. Research and development
49. Camera manufacturing
50. Automotive
51. Electronics
52. Credit union
53. Computer simulation
54. Voltage cabling
55. Electrical
56. Automotive
57. Computer
58. Dietetics
59. Automotive
50. Construction
51. Industrial pneumatics
52. Commercial electrical
53. Automotive
54. Electronics
55. Clerical
56. Detroit Edison
57. Electrical
58. Electronic contracting
59. Invisible fencing
60. Remanufacturing
61. Inventory control
62. Maintenance
63. Industrial electronics
64. Electrical
65. Machine repair
66. Electrical
67. Electronic
68. Automotive manufacturing
69. Chrysler
70. GM
71. Road commission
72. Mechanic
73. Electrical contracting
74. Automotive
75. Electrical trades
76. Hospital facilities management
77. Machine tool
78. Automotive
79. Commercial and industrial electric
80. Automotive

81. GM-Electrical
82. Automotive servicing
83. Rubber industry
84. Transportation
85. Building trade-residential
86. Tool design
87. Manufacturing
88. Electrical
89. Automotive
90. Machine repair
91. Service
92. Music field
93. Oakland city health department
94. Manufacturing

What is your current occupation/job title?

1. Manufacturers' representative
2. Music instructor
3. Director of training
4. Robotics technician
5. Clerk
6. Manager
7. CAD operator
8. Electrician
9. Electrical engineer
10. Mod technician
11. Electrical apprentice
12. Electrical apprentice
13. Electrical maintenance
14. Research engineer
15. Computer repair
16. Communications technician
17. Electric technician
18. Fluid designer
19. Fluid services technician
20. Operations manager
21. Data communications technician
22. Welder
23. Electronic assembler
24. Senior technician
25. Intermediate repair technician
26. Frames builder

27. Maintenance technician
28. Chemist assistant
29. President
30. Audio/visual equipment manager
31. CNC machinist
32. Mechanic
33. Production electrical repair
34. Traffic technician
35. Receiver
36. Electrician
37. Electronics technician
38. Electrician
39. Journeyman electrician
40. Electrician
41. Electronic technician
42. Metal sprayer
43. Detailer
44. General technician
45. Electrician
46. Landscaper
47. R+D Technician
48. Order processor
49. Apprentice machine repair
50. Electrical technician
51. Bank teller
52. Draftsman
53. Cable installer
54. Electrician
55. Electrician
56. Computer technician
57. Dishwasher
58. Technician
59. Laborer
60. Engineer
61. Commercial electrician
62. Assembler
63. Diagnostic technician
64. Receptionist
65. Nuclear security
66. Foreman
67. Apprentice
68. Sales/service
69. Key operator

70. Distribution clerk
71. Maintenance man
72. Technician
73. Electrician
74. Apprentice
75. Electrician apprentice
76. Electronics technician
77. Engineer and automotive technician
78. Job setter
79. Truck driver
80. Electrician
81. Mechanical repair
82. Industrial electrician
83. Test technician in the body test area
84. Controls CAD designer
85. Facilities management technician
86. Controls engineer
87. Lan and system administration
88. Apprentice
89. Audit technician
90. Electrician
91. Automotive technician
92. Maintenance man
93. Currier
94. Carpenter
95. Designer
96. Machine operator
97. GM Electrician
98. Assembler (piecework)
99. Maintenance
100. Security guard
101. Disc jockey
102. Clerk
103. Press operator

What are your top three job responsibilities?

1. Working between the customer and the supplier with regard to quality and product purchasing, designing plant surveys and billing
2. Music instruction, record keeping, maintaining musical instruments
3. Personnel management, project management, teaching
4. Testing, assembly, programming
5. Mail processing, mail distribution

6. Repair autos, auto diagnostics, sell jobs, office/book work
7. Draw on CADS, make prints, data base
8. Building maintenance, automation maintenance, automated manufacturing
9. Design new vehicles, get new vehicles on line, update battery status for electrical cars
10. Modify panel meters, read specs
11. Maintain robots, maintain electrical systems in plant maintain and build electrical panels
12. Maintain production, repair equipment, construction projects
13. Power requirements maintenance, water requirements maintenance, air requirements maintenance
14. New approaches for computer programs, design algorithms, apply patents
15. Repair computers, installing set-ups, configuration
16. Installation, education, consultation
17. Supervise lines for TTD-Michigan Relay Center, take incoming calls, getting interpreters
18. Maintaining equipment, filling out paperwork, communicating with other people and departments
19. Design fluid systems, computer aided design technical support, checking controls
20. Repair equipment, customer service, office work
21. Maintain switch sites, customer service, installation of equipment
22. Install computers and trouble shoot, keep up telephone systems, repair hardware and upgrade systems
23. Make sure materials are right size, make sure assembly is fitted properly, read blueprints
24. Soldering, stripping wires
25. Developing, testing, and modifying automotive electronic modules
26. Repair units, responsible for stripping and receiving of units, customer service
27. Customer service, building frames
28. Repair machines, order parts, keep the shop running
29. Check pumps and gauges, recording data at pump stations, provide daily forms of jobs completed
30. Installing, servicing and repairing of vending machines
31. Maintenance, preparation, warehousing equipment
32. CNC programming, setting up equipment, operation of CNC
33. Brake technician, front end specialist, battery technician
34. Valet parking
35. Electrical repair on machines, parts manufacturing, electrical maintenance
36. Traffic sign placement, review approach permits, investigate accidents
37. Accounts receivable, cashier, data entry
38. Maintaining robots, making sure equipment is running, installing new equipment
39. Product design validation, troubleshooting electronic circuitry, design
40. Troubleshooting, service tooling, debug machinery
41. Making sure all electrical installations are done properly, safety procedures, all work is done up to code
42. Debugging machines, building machines
43. Maintaining test sites, making repairs, maintaining spare parts

44. Spray dies and molds
45. Designing and detailing robotic arms
46. Processing, shipping, printing, mounting/display
47. Power source, maintaining robots, general maintenance
48. Landscaping and lawn work
49. Research and development, robotic programming, program coordinator
50. Data entry, customer service, collection
51. Repair machines, perform preventative maintenance, clean machines and shop area
52. Building test equipment, building prototype boards, purchasing electronic equipment
53. Customer service, offering services of credit union, money management
54. Getting work done on time
55. Pulling cable, terminating cable, getting the job done
56. Keeping plant running, handling everything electrical
57. Keep lines running
58. Putting together computer systems, installation, maintenance
59. Washing dishes
60. Validation of product, repairing, computer skills
61. Digging holes
62. Quoting systems, making sure people are there to make systems run, selling systems
63. Starting and completing jobs
64. Stocking line, making parts fit together, checking for defects
65. Inspect electronic circuit boards, troubleshoot electronic circuit boards, repair circuit boards
66. Protect plant, control access, provide background training for incoming employees
67. Quality, production, management
68. Make sure material is available, make sure work is done properly and in a timely manner
69. Sales, service, installation
70. Supervision, maintenance, troubleshooting
71. Deliver products to the floor
72. Maintain, repair, and keep shop running
73. Electrical wiring, management, electrical building of machines
74. Maintain robotics and other equipment, robotics programming
75. Fix hydraulic equipment and mechanical equipment, fabrication
76. Handing out jobs and following instructions or Master electrician
77. Service and management
78. Create tests on GM vehicle chassis and validate them
79. Run machines
80. Inventory control
81. Traffic signal maintenance, troubleshooting, and billing wiring
82. Repair and monitor hospital equipment, minor plumbing and wall hanging
83. Panel wiring, programming logic controls, getting to work on time
84. Safety testings for body structure and durability, human engineering (how people fit into the car structure)
85. Design paint finishing robotic systems and sealant robotic systems, check blueprints

86. Troubleshoot equipment with problems, preventative maintenance, routine inspection
87. Design machine tools, line up work to be done for others, order parts
88. Data communications systems analyst, Lan administrator, network manager
89. Practical knowledge of volt testing, pipe bending, wiring pulling
90. Measure cars and report findings to customers
91. Maintain welding robot line, maintain machine line, maintain pressing lines
92. Diagnosing problems, replacing parts, and repairing
93. Electrical, hydraulic, machine repair
94. Getting packages off, installing and repairing computers and radios in trucks
95. Design, layout, detail
96. Machining parts, making quality parts, continuous improvement
97. Fix machine chains and make sure machines are in working order
98. Make sure all machine parts are there, are in working order, and fit together
99. Operate machinery and repair machines
100. Security, customer service
101. Constantly moving around the country
102. Customer service, data entry, filing
103. Check the parts, start and stop the press

Of the skills you learned in your OCC EEC courses, which ones have been the most helpful to you?

1. Overall understanding of how electrical systems work in the automotive industry
2. Understanding the fundamentals of electronics
3. PLC program
4. DC Fundamentals
5. Basic electricity; AC/DC circuits
6. DC Fundamentals; AC/DC circuit analysis; digital logic; microprocessors
7. Troubleshooting
8. Schematic diagram
9. Basic electronic
10. AC Fundamentals classes
11. EEC 105, AC Fundamentals
12. Schematic reading
13. Understanding how circuits operate
14. DC Fundamentals
15. DC Fundamentals
16. Fundamentals of electricity from the AC and DC classes
17. DC voltage--fluid systems using DC systems--phases of motors
18. DC class
19. Did not learn very much from the classes
20. DC class
21. Basic overall knowledge; learning about resistors

22. Instrumentation class; hands-on experience; instructors's true life experiences
23. Breadboarding; hands-on experience at the lab
24. Math
25. Problem-solving--analyzing the circuits
26. Alternating circuits electronics
27. Visual class; intro to microprocessors
28. Circuit analysis
29. Mathematics troubleshooting
30. Reasoning skills; mathematics
31. Helped with performing home wiring projects
32. Circuit analysis, intro to microprocessors, digital logic
33. Programming and industrial wiring courses
34. AC/DC
35. Good classes
36. AC/DC
37. Learning code
38. Troubleshooting; basic AC/DC
39. None
40. Learning how things work
41. All are extremely important--could not be used separately
42. AC/DC Fundamentals
43. AC/DC Fundamentals
44. Computer work, lab activities, oscilloscope
45. Troubleshooting
46. Algebra helpful in present job
47. Understanding electrical concepts
48. Ohms Law, DC Electronics
49. None
50. Trig problems; basic electronic boards
51. Good refresher course; good hands-on training
52. AC/DC Fundamentals
53. EEC 102; working on a breadboard in the lab
54. Computer Repair 1+2
55. Formulas; problem-solving skills
56. Voltage and current information
57. Voltage resistance
58. Understanding electrical current
59. Concepts of electricity
60. Knowledge of sensors
61. Labs; electronic theory
62. Hands-on experience
63. Math skills
64. Math skills

65. Basic electrical skills
66. Electronics
67. Just getting the basic idea of how electricity works is fascinating
68. Basically all of the skills
69. Figuring out math equations
70. Robotic programming
71. Troubleshooting
72. Formulas for figuring out voltage
73. The theory
74. Ability to differentiate between the properties of AC and DC, measurement of milvolts, electronic applications
75. How the electronics circuits work
76. Electronics
77. Using multi meter
78. Understanding the way electricity works and troubleshooting techniques
79. Welding was more relevant for me
80. Formulas:figuring out current, amps, and voltages
81. Learned a lot about the architecture of computers and electronics. I.e., DC and AC, the basic fundamentals
82. Electrical theory
83. Electronic skills and DC current machine language for computers
84. Fundamentals classes and basic classes were helpful
85. AC/DC
86. Practical
87. Electronics, DC and automotive information
88. DC and AC motor works, safety
89. Diagnosing electrical problems
90. Learning the basics of electrical and how it works
91. Digital electronics
92. ETT 270 was most useful
93. Voltage
94. Fundamentals of AC and DC
95. Heavy on theory
96. Basic electronic repair and schematic reading
97. Troubleshooting tactics: testing for resistance and voltage
98. Didn't learn anything

What do you think could be done to improve the EEC courses?

1. Greater interface between college and automotive industry, e.g., guest speakers and plant visits
2. More hands-on instruction; labs not real-world enough; some instructors do not have good education skills and are just reading from the book
3. Improve faculty--some are of poor quality and have no educational background and poor level

of commitment
4. More consistency with quality of instructors--some are very poor
5. Offer more advanced courses at more times during the year
6. Very happy with the school and instructors
7. Update electrical knowledge needed for future vehicles
8. More effective class time--more effective teachers
9. Constantly update lab so that equipment matches work world
10. Use of different text--current one full of errors
11. There should more continuity to the program; classes should stick to the syllabus and not go off on tangents
12. Less pressure to have timed tests--enough time should be given to complete a test. Need to go beyond intro classes even if there are only a few students
13. More instructors who work in the field; more lab time
14. Get better, more experienced people to teach the classes
15. Remove open book testing--other schools don't offer this and students are more knowledgeable
16. More hands-on experience; more in-depth labs
17. More lab time
18. More morning classes
19. Break up class from one night for four hours and change to two nights for two hours
20. More classes offered in electronics during the summer
21. More troubleshooting techniques in class
22. More availability of classes
23. More labs
24. Texts not well written and do not go along with the class well
25. Labs need improvement--more time to complete. People are rushed in instead of actually learning the material
26. Offer spring and summer classes
27. More hands on courses and labs are needed
28. Training in surface mounting technology
29. Need more knowledgeable teachers
30. There should be a prerequisite to DC Fundamentals
31. Be able to work on faulty equipment so you could have a real-life situation. Offer TV and VCR repair classes
32. Get more in-depth
33. More hands-on experience
34. Homework should be required--students seem to learn more
35. More focus on troubleshooting, less homework
36. More technology. Have more updated equipment. Don't just show 1970's films about it
37. Keep materials and equipment up to date
38. Prerequisite before you can take classes to keep so many from dropping out
39. Should relate more to what is actually happening in the field
40. Should have more equipment

41. More emphasis on configuration and software
42. More open lab hours
43. Have 2 2-hour classes instead of 1 4-hour class
44. ETT 270 should be offered more than once a year
45. More morning classes
46. More courses on videotape in the media room--convenient for working people
47. More electrical trades; more hands-on work in class
48. More in-depth labs, and more labs
49. Go slower
50. Take Electronics 101 first; AC and DC classes need a lot of math, so unless you have a strong math background, AC and DC are too difficult
51. More hands-on training
52. More hands-on experience
53. Nothing
54. I thought the classes were pretty good
55. Spread courses out over two nights instead of one
56. Expand them into digital communications courses
57. Offer courses both day and evening
58. More than one instructor for the courses
59. Offer courses during the day
60. Students need a little more hands-on activity. Use a broker machine and have students work on it. Just learning all theory, and not how to apply it to the real world
61. The teacher should be better structural wise and in regard to grading procedures
62. Need more night classes; had a hard time getting into them
63. I had some bad instructors; one told the students to teach each other and only use him as a last resort (Mr. Powell in EEC 102 & 105). Take advise from Mr. Rush; he is very good
64. Should offer more day classes. Have teachers that know what they are doing, not just fill-in people. More hands-on experience and a better lab layout. Some of the Electrical classes wouldn't transfer to Lawrence Tech, so I wasted about 25 hours worth of Electrical classes
65. More hands-on training
66. AC/DC construction
67. Find better instructors and get more up to date equipment
68. Could have more practical material. Leave the AC/DC classes to get the broad overview as they are: for diagnosis purposes
69. Had Brent Meyers for intro to DC, and he was very good
70. Don't go so fast during the book; doing one chapter in 3 weeks is too fast
71. More hands-on training
72. AC classes need to be re-structured, they are too heavy in theory, need more practical experience. Also, the course should be divided into Electrical or Engineer
73. More lab time
74. Learning more about troubleshooting, more detail
75. More practical experience is needed, don't need all the theory. 204 was the best class
76. More day classes

77. More classes on the same subjects, more availability
78. More hands-on experience
79. Better qualified instructor
80. Change the teacher

Of the skills you learned in your ETT courses, which ones have been the most helpful to you?

1. Electrical controls
2. Transformer densification
3. Fundamentals of electronics
4. Math configurations--concept of three phased power
5. Troubleshooting
6. Electrical machines, industrial electrical systems
7. Industrial controls class
8. Industrial electrical systems
9. Panel wiring
10. Transformers, basic wiring, code class
11. Industrial controls
12. Wiring diagram
13. Basics, motors, analyzing circuits
14. Three-phase, industrial/electrical
15. Programming logic of electrical controls

What do you think could be done to improve the ETT courses?

1. Should follow the established curriculum. Should be some continuity--don't get someone from GM who hasn't taught for ten years. Have a professor who will stay and teach a few classes--not just pop in and out
2. More hands-on courses needed
3. Should have prerequisites for college algebra, trig, and auto-CAD
4. Relate courses to working in the field--too much textbook work
5. Base lower classes on trade and higher classes on electronics
6. Hands-on training and less theory
7. Should offer courses day and evening
8. Brent Meyers did an excellent job, he covered everything I need to know
9. More hands-on and lab time
10. More in-depth