



OAKLAND
COMMUNITY
COLLEGE

Mr. Orłowski

Auburn Hills Campus
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ELECTRONICS TECHNOLOGY ADVISORY COMMITTEE MEETING

October 3, 1996

Present: Daniel C. Bednarski, Road Commission of Oakland County
Elaine Chapman-Moore, General Motors
Robert Colenso, General Motors Proving Grounds
Richard T. Collins, Oakland Technical Center, Northeast Campus
Doreen Damp, Design/Electro Linc Corporation
Patrick Dean, Paraprofessional, OCC
Michael Domeier, North Starlit TV
Tahir Khan, Chair, Technology Department, OCC
Kim Le, Jabil Circuit Inc.
Verna Love, Counselor, OCC
William Maholick, Ford Motor Company
Roger Martin, Jabil Circuit Inc.
Dr. Carlos Olivarez, Dean, Academic and Student Services, OCC
Dr. Robert Powell, Faculty, OCC
Willard Rush, Faculty, OCC
Ruth Springer, Secretary, OCC
Ray Williams, Chrysler Corporation

1. Welcome and Introductions

Dr. Carlos Olivarez welcomed the group and thanked them for their willingness to serve as members of the advisory committee. He invited those present to introduce themselves.

Following a tour of the Electronics Lab, Dr. Olivarez asked the group for their impressions of the lab and their suggestions for needed changes.

2. Surface Mount Technology

The group mentioned the importance of surface mount technology and their appreciation of the fact that OCC is teaching this. The equipment in the lab is good, but OCC needs to continue to advance in this area.

The group pointed out the need to train students in surface mount soldering skills, especially on fine pitch parts. In order to do this, OCC needs to have the scopes which must be used to solder fine pitch parts.

The group mentioned that the technology in the field is becoming more dense; boards are more dense with components. Students need to be given more hands-on training in this area. In order to do this, OCC needs soldering stations and magnifiers with five diopters capability. Stations need to be outfitted better, with lamps and other needed equipment.

It was suggested that OCC staff visit the lab at Jabil Circuit or at Electro Linc to see what equipment they have and model OCC's lab set-up after theirs.

Mr. Richard Collins said that he visited the training class at Jabil to see what films and other instructional materials they are using. At Oakland Technical Center Northeast, he is in the process of getting proper tables, soldering equipment, and other needed items. This is a long-term investment, but he is building stations steadily. He suggested that OCC staff members might want to sit in on the classes at Jabil and see how they are training their people.

Dr. Robert Powell stated that there is a basic module in the current curriculum for teaching soldering. The change to surface mount soldering could be done without going through a major curriculum revision.

The group agreed that OCC needs at least one or two soldering stations capable of removing or installing surface mount technology.

Dr. Olivarez commented that decisions are currently being made regarding the capital equipment budget for this academic year. If detailed specifications were available on the equipment the group is recommending, a request could be submitted at the meeting the following week.

3. Programming of Chips

It was suggested that technicians in the workplace do a great deal of programming of chips. It is good for students to have this experience while at OCC.

Mr. Willard Rush commented that, in response to recommendations made at past advisory committee meetings, students are doing more programming of Programmable Logic Devices (PLD's), Generic Array Logic (GAL's), and Erasable Programmable Read Only Memory (EPROM's).

Mr. Kim Le pointed out that 28XX Series Flash PROM's are being used widely in the industry instead of EPROM's. OCC currently has the 27 Series in the lab, but it will soon be out of date. He suggested that OCC update to begin using Flash instead of 27 Series or EPROM.

Dr. Olivarez asked what the cost would be to obtain the necessary equipment. The group responded that a machine to teach students could cost \$2,000. They agreed that OCC would not need an advanced piece of equipment, as students could become familiar with that on the job.

Dr. Powell stated that the suggested change could be implemented without a major curriculum revision.

4. Review of Curriculum

Dr. Powell, Mr. Rush, and Mr. William Maholick provided an overview of the curriculum, explaining briefly what is taught in each class.

Dr. Olivarez asked the group for feedback regarding the curriculum.

5. Need for Instruction in Computer Software Applications

Mr. Ray Williams suggested that CIS 105, Personal Computer Applications, be added to the curriculum. This is a good all-round program which would help the technician learn to use software applications.

Dr. Powell responded that, in his restructuring of the EEC and ECT classes he teaches, students are required to use the computer to prepare assignments and reports in conjunction with their course work. If students are not already comfortable with the use of the computer, Dr. Powell teaches them to use it in class.

Ms. Verna Love expressed a concern about how students who are unfamiliar with the computer might react to being required to use it to prepare class assignments. Dr. Powell responded that, in the classes he is currently teaching, he has only two students who were unfamiliar with the computer. He has taught them how to use it, and they are now enjoying working with the computer. Computers are set up in the Electronics Lab for students to use.

The group asked whether all instructors are teaching their classes in this way. Dr. Powell responded that, at the present time, he is the only one doing so. He hopes that, in time, others, including adjuncts, will begin teaching in the same way.

Ms. Love asked whether counselors should encourage students to get some training in computer software applications before taking his classes. Dr. Powell responded that that was not necessary; students should just come to his classes, and he would teach them what they need to know. Mr. Collins asked whether there was a time problem for students who needed to learn to use the computer in addition to learning the material on electronics covered in class. Dr. Powell responded that this was not a problem.

Some members expressed the opinion that all students should take CIS 105 as a part of the Electronics Program, since not all instructors are requiring students to use computer software applications as a part of their EEC classroom instruction. Others felt that it is probably better that this information be learned as a part of the Electronics courses, which are teaching students material that they are strongly motivated to learn. Mr. Collins commented that younger students today have grown up with computers and will already be comfortable with them when they come to OCC.

Ms. Love remarked that she sometimes recommends that students take an adult education course in computer software applications, so that they can overcome some of their fear of computers.

Dr. Olivarez suggested that some programs include a list of recommended electives. CIS 105 could be listed in that way as a part of the Electronics Program.

The group emphasized the importance of all Electronics students having skills in computer software applications before they graduate, as these skills are vital on the job.

6. Possibility of Internship Class

Ms. Love mentioned that students often ask her whether an internship could be included in the Electronics curriculum. Others in the group expressed the opinion that it would be good to include an internship in the curriculum, as there is always a deepening of the knowledge base by going on the job.

Dr. Powell commented that they used to have internships in the past, but the program was dropped for lack of interest. Within the last five years, two co-op classes were incorporated into the Computer Hardware Program, but there was not a great deal of student demand for the classes. Dr. Powell stated that there is a contractual issue involved as well. If only one student signed up for an internship, the faculty member would have to meet with that student for the same amount of time as for a full class. Currently Microprocessor Co-op classes are offered, but are not a required part of

the Computer Hardware Engineering Technology Program. Students who take them are usually already working in the field and seeking to gain credit for their work experience.

7. Need to Update Lab Equipment

Mr. Kim Le expressed the opinion that there is a need for more up-to-date equipment in the Electronics Lab. Today's technology is much faster, yet the instruments in the lab are the same ones he used when he took classes at OCC eight to ten years ago. The lab should have faster instrumentation, such as analog and digital oscilloscopes. The current 100 megahertz scope is too slow. It is not enough just to see a piece of equipment in a textbook. The student needs to use it in order to understand and remember it later on the job. Thus, the latest high-powered equipment should be available in the lab.

Others on the committee expressed the view that it is not necessary to have the latest in advanced equipment in the lab. If students become comfortable with the equipment at a more basic level in class, they will be able to learn to use more advanced equipment on the job.

8. DRT 114

Dr. Powell asked the group for feedback on DRT 114, Electronics Drafting. He believes that, since students already get experience on the drafting board in DDT 100, Fundamentals for the Drafting Industry, it would be better if DRT 114 could be taught using a CAD system.

The group agreed that DRT 114 should be taught using a CAD system.

Mr. Patrick Dean explained that currently students need to use their own personal computers to do their projects using CAD. The DRT 114 instructor is requesting that a CAD room be made available to teach Electronic Drafting using PADS, TANGO, or another software, so that OCC's instruction in this area can be more current with what students will be using on the job in the industry.

Mr. Roger Martin reported that when he took the class, DRT 114 students had to sit in the back of the CAD classrooms and use whatever machines the regular CAD students were not using. There was a great deal of machine sharing, and it was difficult to get projects done. Not all the students had computers they could use at home.

The group agreed that it is difficult to find qualified Printed Circuit Board (PCB) designers using current software. There are a number of good software packages available. Students must have an understanding of the concepts of designing an electrical circuit board, as well as the ability to use current software.

Dr. Powell explained that he was given a free copy of the PADS software awhile back. That is why it is currently in use at OCC.

Ms. Doreen Damp reported that Visuala and Zuken are newer software packages which do the job better, but it is hard to find people with a background in them because they are new. If people have a background in PADS, it is easier for them to learn the newer software on the job. Mr. Le reported that the design department at Jabil Circuit uses Concept, which is the latest software package of which he is aware.

The group also suggested that OCC should be using a software package that does simulation, such as Monte Carlo simulation. This software performs certain checking routines and allows users to add other routines of their own.

Dr. Powell asked the group whether they thought decisions about instructors and software for DRT 114 should be made by faculty in the Electronics area or in the Design area. The group responded that such decisions should be made by those in the Electronics area.

Mr. Williams suggested that an Electronic Drafting class could be created to replace DDT 100 and DRT 114 in the Electronics curriculum. Then the remaining available credit hours could be used to include CIS 105 in the program.

It was also suggested that a course be created to include the software applications taught in CIS 105, with emphasis on the electronic applications of that software.

Another possibility would be to request that the person who teaches the Electronic Drafting course incorporate into the class work applications such as spreadsheets, which are used and needed in the industry.

The group placed strong emphasis on the importance of making CAD facilities available for the use of the Electronic Drafting class.

9. Conclusion

Dr. Olivarez pointed out that each member's packet includes a copy of OCC's new statement of Mission and Purposes. He requested that the members send back to the College any feedback which they would like to provide us after reviewing this document.

Dr. Olivarez thanked the group for coming, and for their information and comments which will help the College to keep the Electronics Technology Program current with the needs of today's electronics industry.

The next meeting of this advisory committee will take place in either the Winter or Spring term, 1997.

Committee Recommendations

1. That OCC obtain the necessary equipment for at least one or two soldering stations capable of removing or installing surface mount technology in order to give students hands-on training in the soldering of fine pitch parts, suggested equipment to include magnifiers, scopes, and lamps.
2. That OCC staff visit the lab at Jabil Circuit or at Electro Linc to see what equipment they have and model OCC's lab set-up after theirs.
3. That OCC staff members visit classes at Jabil Circuit to see what films and instructional materials they are using and how they are training their people in surface mount soldering.
4. That OCC obtain the necessary equipment to teach 28XX Series Flash PROM's.
5. That CIS 105 be added to the Electronics Technology curriculum and/or that instruction in the use of appropriate computer software applications be included in the Electronics classes.
6. That the College explore the possibility of including a co-op internship as part of the Electronics Technology curriculum.
7. That lab equipment be updated as much as possible, so students are able to gain hands-on experience with equipment similar to what they will find on the job in industry.
8. That CAD facilities be made available for the teaching of DRT 114.
9. That DRT 114 be taught using one of the newer software packages, preferably one which does simulation.
10. That decisions about instructors and software for DRT 114 be made by faculty in the Electronics area.

Respectfully submitted,

Ruth Springer, Secretary



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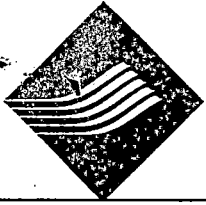
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ELECTRONICS TECHNOLOGY
ADVISORY COMMITTEE MEETING

October 3, 1996

5:30-8:00 p.m.

Room T-6

AGENDA

1. Dinner
2. Welcome and Introductions
3. Tour of Electronics Lab
4. Validity of Curriculum: learning materials, work, learning experiences, related experience
5. Evaluation of Lab Equipment
6. Assessment of Graduates
7. Job outlook: pay, promotion, growth, migration
8. Potential for Growth of Profession in Oakland County/Southeast Michigan
9. Student membership in professional organization

Electronics Technology (ELE)

Auburn Hills

Associate in Applied Science

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
ELT	201*	Electronic Circuits	3
ELT	206*	Electronic Instrumentation	3
ECT	208*	Introduction to Microprocessors	4

Required Supportive Courses

BUS	131	Principles of Supervision	3
DDT	100*	Fundamentals for the Drafting Industry	3
DRT	114*	Electronics Drafting	3
ENG	151★	Composition I	3
ENG	211★	Technical Writing	3
MAT	154*★ ¹	College Algebra	4
<i>and</i>			
MAT	156★ ¹	Trigonometry	3
<i>or</i>			
MAT	163*★ ¹	College Algebra and Trigonometry	4
PHY	161*★	College Physics I	4
PHY	162★	College Physics II	4

General Education Requirements

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

Necessary Electives to Total 62 Credits

TECH PREP STUDENTS

Those students who have completed articulated Electronics TECH PREP programs within the county, 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.

Students are responsible for all prerequisites and/or corequisites—see course descriptions.

This program, leading to an Associate Degree in Applied Science, gives the student experience in direct current electricity, alternating current electricity, electronics, communications systems, and electronic circuitry. The graduate may find employment in a variety of manufacturing operations in industrial, medical, and governmental agencies. Radio and television broadcasting stations also require many trained technicians.

The program also offers the graduate or certificate recipient the opportunity to function as a registered Certified Electronics Technician upon successfully passing the International Society of Certified Electronics Technicians examination (ISCET). Once certified, the student is then eligible to take a Journeyman's test in 10 specialty areas of Computer, Video, Consumer, Industrial, FCC legal, Medical, Audio, Communications, MATV and Radar electronics. A Journeyman certified technician must also have four or more years of education and/or experience in electronics.

¹ MAT 163 can be taken in place of MAT 154 and MAT 156.

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

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

ELECTRONICS TECHNOLOGY

COURSE DESCRIPTIONS

BUS 131 Principles of Supervision

3 Credits

Prerequisite: BUS 101 or consent of instructor.

The student will apply the principles of supervision such as induction, training, disciplining, absenteeism, safety, waste control, equipment layout, grievance control, production control and time study, via role playing and analysis of case studies.

DDT 100 Fundamentals for the Drafting Industry

3 Credits

A course which introduces the student to the drafting industry. Emphasis is placed on the fundamentals so as to help students in their chosen technical program and/or for those who wish to pursue other classes in drafting and design. The course will focus on geometric construction, view interpretation, scales, orthographic and pictorial projection. The basics of dimensioning, lettering, first auxiliary, and sectional views, identification and classification of lines and planes will also be covered. Students will be required to do both freehand and instrument drawings.

DRT 114 Electronics Drafting

3 Credits

Prerequisite: DDT 100, EEC 127.

Students will read and draw electrical and electronics circuit diagrams, including diagrams based on A.S.A. and Military Standards. They will read and draw block and schematic diagrams, printed circuits and wiring and interconnecting diagrams. They will solve problems related to these kinds of circuits thereby identifying and describing design techniques. Course offered spring only.

EC 127 Basic Electronics

3 Credits

Prerequisite: EEC 105 or consent of instructor.

Students will analyze semiconductor devices as applied to basic electronic circuits. Biasing methods, small signal and large signal characteristics of typical transistor amplifiers are examined. Interstage coupling and bypassing are studied. Solid state trouble-shooting is introduced. Electronic instrumentation will be used to verify circuit compliance.

ECT 208 Introduction to Microprocessors

4 Credits

Prerequisite: Two years of secondary school algebra, or MAT 110, or consent of instructor.

Introduction to Microprocessors is designed to introduce individuals who are interested in the application of digital logic to current and popular/commercially available 8 and 16 bit microprocessors including their supporting components. This course will provide information which will enable the student to understand the various families of currently utilized microprocessors.

EEC 102 DC Fundamentals

3 Credits

Prerequisite: One year high school algebra, MAT 110, or equivalent.

This course introduces the basic theories of electricity as they relate to Direct Current such as: the electron theory, Ohm's Law, conductors and insulators, series circuits, parallel circuits, series/parallel circuits, magnetism, electromagnetic devices, electrical nomenclature, units of measurement, resistors, graphic and electrical symbols. Practical laboratory exercises are integrated with the theory to

acquaint the student with the basic processes of constructing functional circuits and the correct use of basic measuring instruments, such as analog and digital multimeters.

EEC 104 AC Fundamentals

3 Credits

Prerequisites: MAT 110, EEC 102 or consent of instructor.

This course will provide students with the fundamental knowledge of AC single phase and the comparison with Direct Current. The effects of inductance and capacitance in AC circuits is emphasized and reinforced by problem assignments dealing with phase relationships. The need and methods for power factor correction are explained. Practical lab experiments are integrated with theory to help students analyze and confirm predicted circuit behavior. This includes the correct use of the oscilloscope and wattmeter.

EEC 105 DC and AC - Circuit Analysis

3 Credits

Prerequisite: EEC 104.

The student will gain understanding of processes and notations used in circuit analysis as employed in today's industry. The problem solving approach is used to aid comprehension of both the mathematics and the electrical theory.

EEC 135 Digital Logic

3 Credits

Prerequisite: EEC 102

This is an introduction to the major applications of digital techniques in electronics. Study subjects begin with the binary number system, binary codes, and typical data representation. A unit on Boolean algebra is included. Study materials emphasize the programmed learning approach reinforced by coordinated laboratory experimentation.

ELT 201 Electronic Circuits

3 Credits

Prerequisite: EEC 127

The student will investigate the theory and application of semiconductor circuits. Using bipolar transistors, JFETS, MOS, and VMOS, class A, B, C, and S amplifiers are constructed and examined. Biasing methods, signal propagation, and trouble-shooting techniques are studied in detail. Coordinated laboratory experiments are integrated to reinforce classroom theory.

ELT 206 Electronic Instrumentation

3 Credits

Prerequisites: EEC 135, ELT 201

The student will study instrumentation methods and procedures utilized in the measurement of operational amplifiers, strain gauges, wheatstone bridges, fiber optics, and transducers. Automatic test equipment, measurement analyzers, signal processing equipment, and oscilloscopes are examined and analyzed. Trouble-shooting techniques using various types of instruments are utilized. Coordinated laboratory experiments are performed to reinforce classroom theory. This course offered spring only.

ENG 151 Composition I

3 Credits

Prerequisite: Satisfactory score on Placement Test.

The student will write compositions of various kinds, applying the rules of straight thinking and the basic principles of rhetoric and language structure.

ENG 211 Technical Writing**3 Credits**

Prerequisite: ENG 131 or ENG 135 or ENG 151 or consent of instructor.

Students will design and write technical reports in various forms. They will also interpret and develop a variety of graphic presentations. Whenever appropriate, they will focus on forms applicable to their occupational needs.

MAT 154 College Algebra**4 Credits**

Prerequisite: Two years of secondary college-prep algebra or MAT 115 with a C or better.

Brief review of algebra fundamentals; equations quadratic in form; rational inequalities; graphing polynomials and rational functions; algebra of functions; including composition; inverse functions; theory of equations, Rational Root Theorem and Descartes' Rule; exponential and logarithmic functions; matrices, determinants and linear programming; partial fractions; mathematical induction; sequences and series; permutations and combinations; Binomial Theorem.

MAT 156 Trigonometry**3 Credits**

Prerequisite: Two years of secondary college-prep algebra or MAT 115.

Definition of the trigonometric functions as circular functions; graphs of the trigonometric functions; development and use of identities; solution of equations; inverse functions; applications; definition of the functions in a right triangle; solution of right triangles; solution of non-right triangles by use of Law of Sines and Law of Cosines; complex numbers and De Moivre's Theorem; vectors; polar coordinates.

MAT 163 College Algebra and Trigonometry**4 Credits**

Prerequisite: Four years of secondary school mathematics including trigonometry.

This course is meant to be a review of: the real number system and basic algebra, including inequalities, absolute value, exponents and radicals; functional notation and composition of functions; linear and quadratic functions; rational and algebraic functions; exponential and logarithmic functions; definition of trigonometric functions using the unit circle; graphs of the trigonometric functions; development and use of identities; right triangle trigonometry; Law of Sines; Law of Cosines; complex numbers including trigonometric form; theory of equations; theory and application of matrices and determinants; inverse functions.

PHY 161 College Physics I**4 Credits**

Prerequisite: MAT 156 or MAT 163 or consent of instructor.

The student will investigate the physical aspects of mechanics, sound and heat. The student will perform measurements and experiments in mechanics, sound and heat.

PHY 162 College Physics II**4 Credits**

Prerequisite: PHY 161.

The student will study electricity, magnetism, optics and selected topics in atomic physics. The student will conduct experiments in electricity, magnetism and optics.