OAKLAND
COMMUNITY
COLLEGE

Auburn Hills Campus
2900 Featherstone Road, Auburn Hills, MI 48326-2845 (810) 340-6500 Fax: (810) 340-6507

ROBOTICS/AUTOMATED SYSTEMS TECHNOLOGY

ADVISORY COMMITTEE MEETING

September 22, 1997

5:00 - 7:00 p.m.

Room T-6

AGENDA

1. Dinner
2. Welcome and Introductions
3. Review of Minutes of Last Advisory Committee Meeting
4. Review of Minutes of Follow-Up Meeting: Progress Report
5. Open Discussion

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ROBOTICS/AUTOMATED SYSTEMS TECHNOLOGY

ADVISORY COMMITTEE MEETING

March 24, 1997

Present: Eric R. Anderson, FANUC Robotics North America Inc.
Linda Casenhiser, Manufacturing & Technological Services, OCC
Sally Kalson, Coordinator of Cooperative Education, OCC
Bob Lieblang, FANUC Robotics North America Inc.
Dr. Carlos Olivarez, Dean, Academic and Student Services, OCC
Randy Schroeder, FANUC Robotics North America Inc.
Ruth Springer, Secretary, OCC
Doug St. Clair, Faculty, OCC

Preliminary Matters

Dr. Carlos Olivarez welcomed the group and thanked them for their participation. The minutes of the Robotics/Automated Systems Technology Advisory Committee meeting held on October 10, 1996, were reviewed and approved as written.

Information Regarding Curriculum

Mr. Doug St. Clair distributed a handout describing a number of proposed curriculum changes (see attachment). The first page includes several minor course changes having to do with course prerequisites. Mr. St. Clair went over the list and explained why each change is being proposed. Certain courses currently listed as course prerequisites for certain Robotics classes are not, in fact, needed in order to understand the material covered in those classes. Those courses will be deleted as prerequisites, but will continue to be listed as required supportive courses for the Robotics Program. This is being done so that students may proceed more easily through the succession of Robotics courses without being slowed down by the need to take a number of prerequisites first. Every year the Robotics classes are offered in the same order, so students can plan their course of study accordingly.

Mr. St. Clair reported that ECT 208, Introduction to Microprocessors, will be deleted from the program in order to make room for a new advanced Programmable Logic Controller (PLC) class. That is, one Robotics class will be added to the list of major requirements, and one required supportive course will be deleted. There will be no change in the total number of credits needed to graduate from the associate degree program, but there will be an additional four credits added to those needed to receive the certificate.

Mr. St. Clair explained that he and Mr. Sefcovic are working to provide students with a more continuous flow on tasks from ROB 150, Introduction to Robotic Technology, through the more advanced classes. In ROB 150, students program eight tasks. Then in more advanced classes, they do more complex assignments using the same eight tasks.

Mr. St. Clair reported that the Perceptron equipment is now operational, and Mr. Sefcovic is able to give a demonstration on it. As they learn the system better, it will be incorporated into classes.

Progress Report on Advisory Committee Recommendations

The minutes of the follow-up meeting of OCC members of the advisory committee held on December 10, 1996, were reviewed, and a progress report was given on each committee recommendation, as follows:

1. That a strong emphasis be placed on the teaching of troubleshooting skills.

Mr. Doug St. Clair reported that troubleshooting skills are taught on an ongoing basis in all Robotics classes. In particular, a strong emphasis is placed on troubleshooting in ROB 250, Automated Controller Maintenance.

2. That OCC explore the possibility of including a co-op experience in the Robotics Program.

Ms. Sally Kalson reported that she is exploring the process which must be followed to get a designation for co-op classes within the College system. She believes this is really needed, as she gets many calls from companies who would like to hire co-op students in the Robotics major. Both companies and students would like to see OCC have a co-op program in this major. Ms. Kalson suggested that a co-op class could be listed as a required supportive course, with the understanding that students who did not wish to be involved in co-op could substitute another appropriate course, as is done in the Computer Aided Design and Drafting Program.

Committee members from FANUC Robotics North America Inc. agreed that FANUC is strongly in favor of using co-op students, but they must be hired through a contract agency to work there, rather than being hired directly by FANUC.

Ms. Kalson reported that the possibility of adding a co-op class to this program is still being explored.

3. That OCC explore the possibility of placing equipment from Dynalog, Inc. in the Robotics Lab on a consignment basis.

Mr. St. Clair pointed out that there is a problem with having equipment placed in the lab on a consignment basis, since the company can remove the equipment at their discretion. If the same equipment is not in use every semester, it creates a gap in the program, since some students receive instruction on that equipment, while others do not.

4. That OCC attempt to provide some instruction in simulation as a part of the Robotics Program.

Mr. Doug St. Clair reported that it would not be possible to teach simulation software in the Robotics classes because the program is already very long. However, it might be possible to do demonstrations for Robotics classes, using simulation software which is currently available in OCC's Virtual Reality Lab. Mr. St. Clair stated that he does receive calls on a regular basis from employers looking for workers who know simulation software. However, he believes it would make the program too long if more credit hours were added in order to include this instruction.

Ms. Linda Casenhiser suggested that possibly short courses could be offered through OCC's Manufacturing & Technological Services. This could help determine if there is enough demand for such instruction to warrant adding it to the program.

5. That instruction in blueprint reading and schematic reading be included in the Robotics Program.

Mr. St. Clair reported that in ROB 250, Automated Controller Maintenance, they are using more electrical drawings on the RJ Controller, as well as on the RC.

6. That an advanced Programmable Logic Controller (PLC) class be added to the curriculum.

Mr. St. Clair referred the group to the second page of the curriculum handout (see attachment) which describes the new Advanced Controls Applications class which is being put together. Approval of this course is currently being sought through OCC's curriculum process. It will not be just a PLC course, but it will also include instruction in human machine interface. The new course will not appear in OCC's 1997-98 catalog, but it is expected to be offered for the first time in Winter 1998.

7. That OCC explore the possibility of adding classes in the repair of personal computers and in C programming to the curriculum.

Mr. Eric Anderson commented that many people don't know the basics of how a personal computer operates. Such information would be helpful to those in the Robotics Program, because if you understand the structure of personal computer repair, you understand the structure of robot repair.

C programming is used in the application programs they develop at FANUC. The important thing for students would be some instruction in a structured language so they have an idea of what is involved. Mr. Anderson stated that, in hiring new employees, he looks for this kind of basic understanding of computer and language.

Mr. St. Clair explained how programming concepts are taught in the Robotics classes.

Ms. Kalson asked the group how OCC's students compare with those from other schools in regarding to the need for an understanding of programming. Mr. Anderson commented that he normally hires mechanical engineers. He finds that a two-year program does not provide all the skills needed in his area of work.

Mr. Bob Lieblang pointed out that, to work on robots, students need an understanding in three areas: robots, electromechanical, and computer. It is very difficult to include all the needed instruction in a two-year program.

8. That instruction in basic wiring be included in the Robotics Program.

Mr. St. Clair reported that Mr. John Sefcovic has developed a number of very effective wiring labs for use in teaching ROB 166, Sensor Technology. Mr. St. Clair explained that, in the new advanced PLC class, more debugging of PLC circuits will be included. There is a model factory in the PLC lab. Its use will be incorporated into the advanced class, so that students will be required to program through the entire factory.

9. That the material needed by Robotics students in the areas of Pneumatics and Hydraulics be taught in a single class, rather than requiring ATF 140, Introduction to Hydraulics, and ATF 147, Fundamentals of Pneumatics.

Mr. Lieblang and Mr. Anderson agreed that students need primarily an understanding of pneumatics. An understanding of hydraulics is less important. If only one class is included in the curriculum, it should emphasize pneumatics, rather than hydraulics.

10. That AC and DC Fundamentals be taught as a single class for the Robotics Program.

Mr. Lieblang suggested that instruction in DC and AC electronics should not be combined into one class. He believes that all the instruction included in the two classes is needed by students going into the robotics field. Those who are suggesting that the instruction be condensed into one class are looking at it from the vantage point of 20 years of experience. For them, the content is simple, but that is not the case for someone who has no background in that area of instruction.

11. That OCC explore the possibility of including more instruction in communication skills, including writing, speech, and listening skills, as a part of the Robotics Program.

Dr. Olivarez reported that he will be contacting Mr. Wally Smith to find out exactly what is taught in SPE 129, Interpersonal Communication. It may be possible to use the existing SPE 129 class to teach subject matter which is needed by Robotics students. Perhaps one section of the course could be marked in the Schedule of Classes with a footnote designating it for technical students. Other advisory committees have also indicated that this is a need.

Mr. Anderson stressed the importance of communication skills, including such things as written reports, and even the ability to leave a phone message that is clear, concise, and accurate.

12. That tours of area companies be included as a part of the instruction offered in the Robotics Program.

Mr. Randy Schroeder reported that he has talked to the Vice President of Manufacturing at FANUC about the possibility of student tours, and he has expressed himself as being in favor of the idea as a great way to introduce people to the robotic field. Mr. Schroeder will work with Mr. St. Clair and Mr. Sefcovic so that a tour of FANUC can be integrated into the appropriate course syllabus in the future.

Math Requirements

Dr. Olivarez raised the possibility of reducing the math requirement in the Robotics Program to just one course, MAT 154, College Algebra. He noted that this course alone would meet the general education requirement, without the addition of MAT 156, Trigonometry.

Ms. Casenhiser asked whether College Algebra is the proper course for this program, or whether an applied math course might be more appropriate. The group responded that, if a math class is needed, it should be one that fulfills the general education requirement.

Ms. Casenhiser suggested that students could be offered a choice between College Algebra or an applied math course. Those going on to a four-year university could take College Algebra, while those just wanting a two-year degree could take the applied math course. Ms. Casenhiser cited the situation of a student who has taken all the other courses in the Robotics Program and is working in the field. She only needs the two math courses to graduate, but does not feel she needs them in order to achieve her career goals.

Dr. Olivarez asked whether these math courses are needed in the program. The group responded that they do not really use math on the job now, although it may have been needed in the past.

Dr. Olivarez will talk with Mr. St. Clair regarding the math requirements to explore the possibility of deleting one math course and adding a course in computer repair, which the group thought would be beneficial.

Assessment of Graduates

In regard to the curriculum, Mr. Lieblang commented that it is not bad, but it is lacking in the mechanical area.

The group agreed that more than a two-year degree is needed for their job positions. They do hire some people with only a two-year degree if they are top students, but those employees are unable to advance within the company without a four-year degree. Mr. Lieblang suggested that OCC should be communicating to students that they really need to continue their studies beyond what they obtain at OCC. Mr. Anderson stated that he needs people who have a degree in engineering, but who are also hands-on in their orientation, so that they can troubleshoot and figure things out.

Ms. Kalson mentioned the importance of the co-op experience. Mr. Anderson agreed, stating that many of his successful people have had co-op experience.

It was suggested that there is a need to survey students in the Robotics Program to find out what kind of students the program is serving, and what their needs and career goals are.

Conclusion

Dr. Olivarez explained that the Michigan Board of Education requires that all community college occupational programs be evaluated once every five years. As a part of this process, evaluation forms are to be filled out by students, staff, and advisory committee members. Since the Robotics/Automated Systems Technology Program is being evaluated during the 1996-97 school year, he requested industry representatives in the group to fill out evaluation forms before leaving the meeting.

Committee Recommendations

1. That a strong emphasis be placed on the teaching of troubleshooting skills.

2. That OCC explore the possibility of including a co-op experience in the Robotics Program.

3. That OCC explore the possibility of placing equipment from Dynalog, Inc. in the Robotics Lab on a consignment basis.

4. That OCC attempt to provide some instruction in simulation as a part of the Robotics Program.

5. That instruction in blueprint reading and schematic reading be included in the Robotics Program.

6. That an advanced Programmable Logic Controller (PLC) class be added to the curriculum.

7. That OCC explore the possibility of adding classes in the repair of personal computers and in C programming to the curriculum.

8. That instruction in basic wiring be included in the Robotics Program.

9. That the material needed by Robotics students in the areas of Pneumatics and Hydraulics be taught in a single class, rather than requiring ATF 140 and ATF 147.

10. That AC and DC Fundamentals be taught as a single class for the Robotics Program.

11. That OCC explore the possiblity of including more instruction in communication skills, including writing, speech, and listening skills, as a part of the Robotics Program.

12. That tours of area companies be included as a part of the instruction offered in the Robotics Program.

13. That if material needed by Robotics students in the areas of Pneumatics and Hydraulics is taught in a single class, the primary emphasis of the class be on pneumatics.

14. That EEC 102, DC Fundamentals, and EEC 104, AC Fundamentals, continue to be included as required supportive courses in the Robotics curriculum.

15. That OCC consider the possibility of deleting one math course from the Robotics Program and adding a course in the repair of personal computers.

16. That Robotics students be surveyed to find out what kind of students the program is serving and what their needs and career goals are.

Respectfully submitted,

Ruth Springer

(advw97:rob0324.min)

MINOR COURSE CHANGES

Justification of Changes in Prerequisites For The Robotics Program

The following changes in the prerequisites and corequisites were recommended by our last advisory meeting. These courses will still be required as supportive courses but are not needed in the sequence that is specified in our current catalog.

ROB 152 Prerequisite ROB 150

ATF 140 - INTRODUCTION TO HYDRAULICS is not needed as a prerequisite for the ROBOT MANIPULATOR DRIVES AND LINKAGES class. Robots are all electric. Hydraulics is still needed because of the associated machinery that robots work with in industry, but robots are no longer using hydraulic systems for power.

ROB 162 Prerequisite ROB 150

EEC 104 - AC FUNDAMENTALS is not needed as a prerequisite for INDUSTRIAL ROBOTIC APPLICATIONS because Rob 162 is a robotic applications programming class and does not require an electrical background.

ROB 166 Prerequisite ROB 162

EEC 102 - DC FUNDAMENTALS is not needed as a prerequisite for SENSOR TECHNOLOGY. This class concentrates on the devices that are used to feed information into the robot controller.

ROB 240 Prerequisite ROB 164

This is the only prerequisite that is needed for AUTOMATED SYSTEMS APPLICATIONS. This is a systems class in which the students manufacturing cells.

ROB 250 Prerequisite ROB 166

This a troubleshooting class in which the student needs to understand the interfacing capabilities of the robot controller.

NEW COURSE: ADVANCED CONTROLS APPLICATIONS

—Learning Objectives

The course will be structured to provide the student with an understanding of the relationship between the "real time" control systems and the industrial devices, machines, and processes that are controlled. A systems approach will be used in the course to illustrate the interaction of the hardware and software necessary to achieve a functional and reliable automation system.

Advanced programming concepts and structures of automated control systems.

Various applications will be defined in which the student will develop the written hardware and software specification for each of the process problems.

The use of the Model Factory and Robotic Assembly Cell will give the student practical programming and troubleshooting skills that are used in the design and maintenance of automated systems.

Controller Language Structures

- Advanced Relay Instructions
- Advanced Addressing Concepts
- Compute/Comparison Instructions
- Bit Modify and Move Instructions
- File Instructions
- Shift Register Instructions
- Message Instructions
- Block Transfer and Analog Input/Output
- Processor Software Configuration

Controller Hardware Architecture

- Input/Output Systems Configuration
- Hardware Installation
- Communication Structure

Graphical Interface

- Human Machine Interface
- Data Collection and Control
- Alarm/Report Generation

Programming Applications

- Program Development and Documentation
- Application Program Debug
    - Robotic Assembly Systems
    - Model Factory

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ADVISORY COMMITTEE

Eric R. Anderson
FANUC Robotics North America Inc.
2000 S. Adams Rd.
Auburn Hills, MI 48326-2800
810-377-7556

Doug Cicchini
Robotic Production Technology
30545 Stephenson Hwy.
Madison Heights, MI 48071
810-583-2185

Gary L. Clement, Ph.D.
Mail Drop 483-014-201
MFD Pontiac Manufacturing
General Motors Corp.
One Pontiac Plaza
Pontiac, MI 48340
810-857-4490

Lisa A. Klein
Infinite Systems
2285 Opdyke, Suite D
Auburn Hills, MI 48326
810-377-9900

Bob Lieblang
FANUC Robotics North America Inc.
2000 S. Adams Rd.
Auburn Hills, MI 48326-2800
810-377-7443

Marv Long
United Training Services
17320 W. 12 Mile
Southfield, MI 48076
810-559-6940

Thomas R. Rice
Oakland Technical Center - NE
1371 N. Perry
Pontiac, MI 48340
810-857-8500

Randy Schroeder
FANUC Robotics North America Inc.
2000 S. Adams Rd.
Auburn Hills, MI 48326-2800
810-377-7444

Tom Short
ABB Flexible Automation Inc.
1250 Brown Rd.
Auburn Hills, MI 48326
810-391-8549

Carl Traynor
Dynalog, Inc.
28588 Northwestern Hwy., Suite 260
Southfield, MI 48034
810-208-3815

OCC Members

Joe Burdzinski
Manufacturing & Technological Services
810-340-6710

Linda Casenhiser
Manufacturing & Technological Services
810-340-6711

Sally Kalson
Coordinator of Cooperative Education
810-340-6608

Tahir Khan
Chair, Technology Department
810-340-6688

Willie Lloyd
Director of Placement and Cooperative Education
810-340-6735

Pat May
Counselor
810-340-6560

Dr. Carlos Olivarez
Dean, Academic and Student Services
810-340-6566

Dr. Diann Schindler
Campus President
810-340-6537

John Sefcovic
Paraprofessional
810-340-6685

Ruth Springer
Secretary
810-340-6525

Doug St. Clair
Faculty
810-340-6699

OCC Guests

Dr. David Doidge
Dean, Academic and Student Services
810-471-7707

Martin Orlowski
Director, Institutional Planning & Analysis
810-471-7746

6/16/97
(advw97:rob.lst)