OAKLAND
COMMUNITY
COLLEGE

Memo

TO: ALL ORCHARD RIDGE STAFF

FROM: CAROL BROWN

SUBJECT: POOL UPDATE

DATE: MARCH 30, 1995

Due to the present financial difficulties of the college, we will be unable to fix the pool at this time. However, we are looking for alternative sites in order to meet the instructional needs of our students.

CB/es

12/92 EXPECTED COMPETENCIES FOR ROB 152

This is a list of the expected student competencies for the Robotics 152 course. The student will have completed these expectations by the end of this course.

AT THE END OF THE ROB 152 COURSE THE STUDENT WILL BE ABLE TO:

1. describe personal safety procedures when working with the robot mechanical unit

2. explain the purpose of a burn-in program (exercise program) that will be used after a robot has been mechanically repaired

3. explain the term repeatability and why it is important to the robot

4. describe the memory structure of the GMF (FANUC) R-C controller

5. define what a software limit is in reference to a work envelope

6. set the maximum software limit on the base rotational axis on the GMF A-series robot

7. write a step by step procedure to limit the base rotational axis on the GMF A-series robot

8. write a step by step procedure to limit the base rotational axis on the GMF Karel A-510 robot

9. write and enter a repeatability program for the IBM 7535 robot

10. write and enter a repeatability program for the GMF R-C A-series robot

11. write and enter a repeatability program for the GMF Karel A-510 robot

12. write and enter a repeatability program for the IBM 7576 robot

13. explain the concept of a grid shift in reference to the robot mechanical unit

14. write a step by step procedure for entering a grid shift in the GMF R-C controller

15. adjust the near zero limit switches on the GMF R-C A-series robot

16. write a step by step procedure to adjust the near zero limit switches on the GMF R-C A-series robot

17. properly set the overtravel switches on the GMF R-C A-series robot

18. write a step by step procedure to adjust the electro-mechanical brake on the GMF R-C A-1 robot

19. list the major components of a harmonic drive

20. list four types of drive mechanisms used on the GMF R-C A-1 robot

21. list four types of drive mechanisms used on the IBM 7576 robot

22. list the preventive maintenance procedures for the GMF Karel A-510 robot using manufacture's documentation

23. discuss general lubrication procedures for robot mechanical units

24. explain the operation of a cyclo drive

25. describe the torque sequence when tightening a circular bearing retainer plate with eight bolts

162COMCY

10/93 EXPECTED COMPETENCIES FOR ROB 162

This is a list of the expected student competencies for the INDUSTRIAL ROBOTICS APPLICATIONS course. The student will have completed these expectations by the end of the course.

AT THE END OF THE ROB 162 COURSE THE STUDENT WILL BE ABLE TO:

1. list five components that should be considered in the process of program design
2. identify what a robot program is
3. explain the two types of programs used by a robot controller
4. define the term OFF-LINE PROGRAMMING
5. describe the process of PALLETIZING
6. use proper flowchart symbols when defining a robot task
7. list the two types of branches that can be used in a robot program
8. explain the term INTERFACING between the robot controller and its peripheral components
9. list four basic programming functions and describe their purpose
10. define the term END EFFECTOR
11. define the term END OF ARM TOOLING
12. list four common applications in which robots can be used
13. define the term TRANSDUCER
14. identify four types of sensors that can be used in robotic work cells
15. describe the function of a strain gage
16. explain the formula for computing the payback period for a robot

SEFCOVIC, JOHN P.
AH - Technology
Paraprofessional
Office: 340-6685
Home : 569-3402
PROFS/CMS: JPSEFCOV

Marposs Corporation	Auburn Hills
General Motors Truck & Bus Group	Pontiac
Oakland Community College	AUBURN HILLS
Trellis Software & Controls	Rochester Hills

ROBOTICS/AUTOMATED SYSTEMS PROGRAM STUDENT OUTCOMES

1. PROGRAM OUTCOME:
(upon completion of the program, e.g. a student will demonstrate . . . .)The following maintenance procedures and considerations:

* safety
* robot mechanical design and adjustments
* sensor selection and installation
* end effector nomenclature and installation
* controller architecture
* controller/manipulator installation
* preventive maintenance
* PLC installation/diagnostics
* troubleshooting/diagnostics
* interpretation of schematics

ASSESSMENT TOOL/ACTIVITY:

Student will be given a robotics workcell that has had "bugs" put into it. The student will diagnose the problem(s), and will get the cell back into operation.

PERSON RESPONSIBLE:
(e.g. Instructor, Counselor, Co-op Coordinator, Dean . . . .)
Instructor

RESULTS DISTRIBUTED TO:
(e.g. student, Co-op Coordinator, Dean . . . .)
Student

FEEDBACK/USE OF RESULTS:
(e.g. placement; grading/evaluation . . . .)
The results will be evaluated and graded

2. PROGRAM OUTCOME:
(upon completion of the program, e.g. a student will demonstrate . . . .)The following programming proficiencies:

* use of basic programming structures/logical sequences
* use of manufactures prgramming languages
* use of interpolated motion commands
* address interfacing/peripheral devices
* use PIC logic structures/programming language

ASSESSMENT TOOL/ACTIVITY:

Student will be given an assigned task and will use the above proficiencies to successfully accomplish this task.

PERSON RESPONSIBLE:
(e.g. Instructor, Counselor, Co-op Coordinator, Dean . . . .)
Instructor

RESULTS DISTRIBUTED TO:
(e.g. student, Co-op Coordinator, Dean . . . .)
Student

FEEDBACK/USE OF RESULTS:
(e.g. placement; grading/evaluation . . . .)
evaluation/grading

3. PROGRAM OUTCOME:
(upon completion of the program, e.g. a student will demonstrate . . . .)The following integration concepts:

* types of automation used in workcells
* aspects of mechanical, electrical, software integration
* communication/computer interfacing in cell integration
* with respect to various applications
  ** pelletizing/material transfer
  ** spot welding
  ** arc welding

ASSESSMENT TOOL/ACTIVITY:

Student will design and integrate all activities in a robotics workcell for a given application.

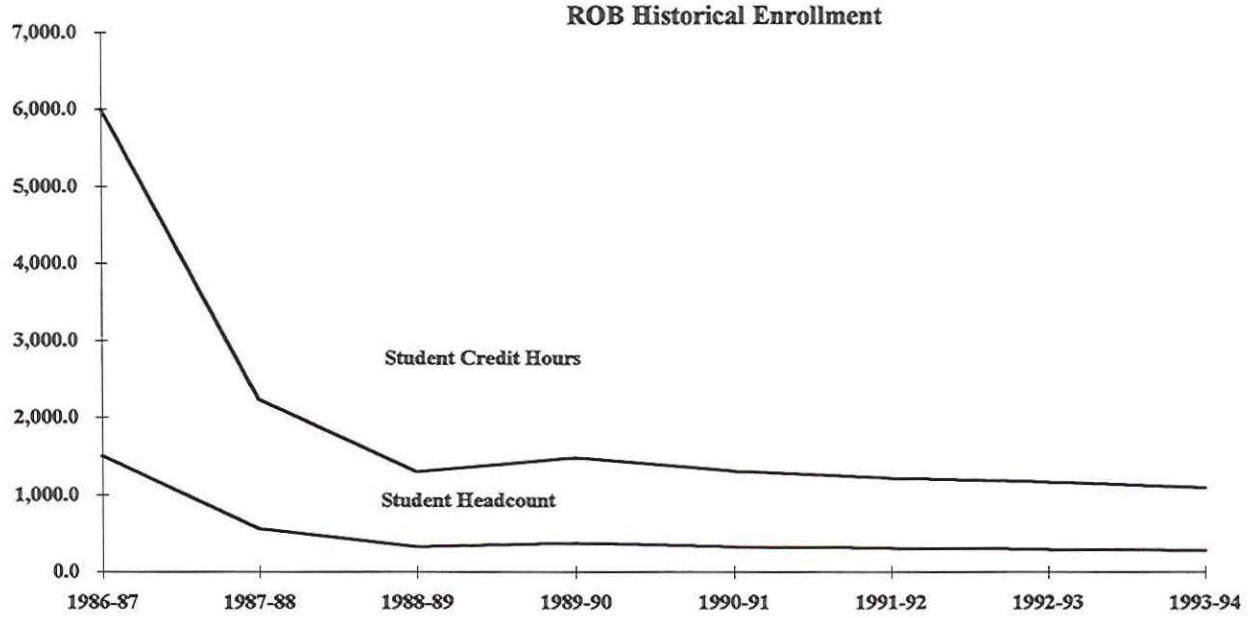
PERSON RESPONSIBLE:
(e.g. Instructor, Counselor, Co-op Coordinator, Dean . . . .)
Instructor

RESULTS DISTRIBUTED TO:
(e.g. student, Co-op Coordinator, Dean . . . .)
Student

FEEDBACK/USE OF RESULTS:
(e.g. placement; grading/evaluation . . . .)
evaluation/grading; successful placement with industry

Table 1
Annual Student Credit Hours and Duplicated Headcount

		1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	Percent Change	
	**	SCH	SCH	SCH	SCH	SCH	SCH	SCH	SCH	5- Year	10- Year
Student Credit Hours	xx	6,002.0	2,234.0	1,292.0	1,482.0	1,304.0	1,216.0	1,164.0	1,084.0	-26.9	-74.3
Student Headcount	xx	1,504	559	327	372	326	304	291	271	-27.2	-74.5



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23. discuss general lubrication procedures for robot mechanical units

24. explain the operation of a cyclo drive

25. describe the torque sequence when tightening a circular bearing retainer plate with eight bolts

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10/93 EXPECTED COMPETENCIES FOR ROB 162

This is a list of the expected student competencies for the INDUSTRIAL ROBOTICS APPLICATIONS course. The student will have completed these expectations by the end of the course.

AT THE END OF THE ROB 162 COURSE THE STUDENT WILL BE ABLE TO:

1. list five components that should be considered in the process of program design

2. identify what a robot program is

3. explain the two types of programs used by a robot controller

4. define the term OFF-LINE PROGRAMMING

5. describe the process of PALLETIZING

6. use proper flowchart symbols when defining a robot task

7. list the two types of branches that can be used in a robot program

8. explain the term INTERFACING between the robot controller and its peripheral components

9. list four basic programming functions and describe their purpose

10. define the term END EFFECTOR

11. define the term END OF ARM TOOLING

12. list four common applications in which robots can be used

13. define the term TRANSDUCER

14. identify four types of sensors that can be used in robotic work cells

15. describe the function of a strain gage

16. explain the formula for computing the payback period for a robot

17. describe the safety consideration when working in close proximity with a robot while teaching a program

GMF R-C LANGUAGE

18. explain how an R-C program is named

19. describe how the linear mode is set in a program for arc welding

20. explain how the speed of an R-C robot is controlled in the teach mode and also in the repeat mode

21. list how many operational registers are available and the size of the numbers that can be stored

22. describe the function of these operational registers

23. list the G code used to obtain sixteen service codes in a program address

24. explain three different jog modes that can be used by robots

25. list the operational aides available on the R-C controller

26. write an assigned application program, safely enter it into the controller and execute it successfully

GMF KAREL LANGUAGE

27. demonstrate a proficiency of the Karel language by writing an assigned application program, safely enter it into the controller and execute it successfully

PROGRAMMABLE CONTROLLERS

28. write, enter and execute an assigned ladder logic program

29. demonstrate an understanding of the memory structure of the ALLEN BRADLEY 2/05 PLC

30. explain the address system used when writing a PLC program

164comcy

4/93 EXPECTED COMPETENCIES FOR ROB 164

This is a list of the expected student competencies for the ROBOTICS 164 course. The student will have completed these expectations by the end of this course.

At the end of the Rob 164 course the student will be able to:

1. explain the process called GAS METAL ARC WELDING (GMAW)

2. use the welding charts given by the AMERICAN WELDING SOCIETY for the classification of welding electrodes to select proper welding electrodes

3. explain how to read GMAW electrode classifications

4. list various shielding gases and their proper use

5. demonstrate the use of proper joint design

6. explain the various weld positions with reference to correct weld parameters (plate thickness, wire diameter, etc)

7. state proper safety procedures when working around robots

8. state correct safety precautions used for a welding robot

9. demonstrate a robot program using linear interpolation for the GMF Karel, GMF R-C, and IBM AML2 languages

10. demonstrate proper teaching procedures for safely controlling (jog speed of robot) the GMF A-510, GMF A-1, and IBM 7576 robots

11. demonstrate a Karel program using the VECTOR command and an AML2 program using the DPMOVE command

12. create a program and demonstrate correct use of the circular motion commands in KAREL and AML2

13. demonstrate programs in KAREL and AML2 using continuous motion

14. transfer a program using the LOCAL AREA NETWORK

15. develop and demonstrate a program in which the robot will draw an assigned letter of the alphabet

16. demonstrate safe procedures using a robot for the GMAW process

17. using KAREL, demonstrate the use of ASSOCIATED DATA when using the PATH variable

18. explain the coordinate systems that can be used in robotic

applications

19. explain the concept of passing parameters in a KAREL program

20. describe how a RESISTANCE weld is developed using correct terminology

1/94

EXPECTED COMPETENCIES FOR ROB 166

This is a list of the expected student competencies for the SENSOR TECHNOLOGY course. The student will have completed these expectations by the end of this course.

AT THE END OF THE ROB 166 COURSE THE STUDENT WILL BE ABLE TO:

1. list three methods in which sensors are used to prevent people from entering an active robots work cell

2. classify sensors according to the type of interface that is used

3. explain the binary numbering system

4. configure the parameters for the GMF R-C controller for a given I/O application

5. define the term sensor

6. explain the I/O system on the IBM 7576 controller and identify how many points of I/O are standard

7. explain the I/O system on the GMF R-F controller and how it is configured

8. list three basic reasons sensors are used in automation

9. sensors used in most manufacturing systems can be grouped into three categories. List them

10. define the term transducer

11. explain the basic operational theory of strain gages

12. list two types of proximity sensors

13. list four types of photo-electric sensors

14. explain the difference between fixed and expandable I/O robot controllers

4/93

EXPECTED COMPETENCIES FOR ROB 250

This is a list of the expected student competencies for the Robotics 250 course. The student will have completed these expectations by the end of this course.

AT THE END OF THE ROB 250 COURSE THE STUDENT WILL BE ABLE TO:

1. write a summary paper on a current robot product line and the type of controller being used

2. explain proper safety procedures involved in troubleshooting automation controllers

GMF R-C CONTROLLER

3. write and execute a program in the GMF R-C language that will test the I/O configuration of the controller

4. explain the AC distribution for the R-C controller

5. list the test points for the AC distribution on the R-C controller and the values that should be found (480 input)

6. list the fuses, their values, and why they are in the circuit for the AC input board

7. explain the troubleshooting procedures for the AC input board

8. demonstrate proper and safe use of the multi-meter and record values at the test points on the AC input board

9. troubleshoot and correct problems involving the AC board

10. explain DC distribution, test points, fusing and adjustments on the R-C power supply board

11. explain the troubleshooting procedures for the power supply

12. use multi-meter and record voltages on power supply

13. list the connectors on the master printed circuit board and their functions

14. list the LEDs and their importance to troubleshooting the master PCB

15. describe the type of processor and coprocessor used in the controller and their relationship to controller operation

16. explain the troubleshooting procedures for the master printed circuit board

17. explain the function of the DI/DO (interfacing) board

18. describe the fuses and their functions on the DI/DO board

19. demonstrate proper troubleshooting procedures in correcting problems with the DI/DO board

20. explain the operation of the servo system

21. visually examine and describe servo system components

22. describe proper troubleshooting techniques for the servo system

23. explain software problems that could be involved in controller failure

24. explain the function and grouping of R-C error codes

25. demonstrate the use of diagnostics in effective troubleshooting

GMF R-F KAREL CONTROLLER

26. explain the AC distribution and compare to the R-C controller

27. explain the DC distribution and compare to the R-C controller

28. describe the types of microprocessors and their relationship to the R-F controller operation

29. describe the operation of the R-F servo system

30. describe the I/O configuration on the controller

31. demonstrate the use of error codes and diagnostics in troubleshooting controller malfunctions

IBM 7576 ROBOT AND 7572 CONTROLLER

32. diagram controller configuration

33. compare system configuration to the GMF R-F controller

34. identify controller components

35. explain the use of error codes and diagnostics in troubleshooting procedures