9/3/2024	DATE	TEC	DIVISION
☑	REQUIRED COURSE	☑	NEW COURSE
☐	ELECTIVE COURSE	☐	REVISION

Lake Land College

Course Information Form

COURSE NUMBER:	APTC-057		**TITLE:** *(30 Characters Max)*	Robot Systems Integration I							
SEM CR HRS:	1.0	**Lecture:**	0.5	**Lab:**	1.0	**ICCB Lab:**	1.0	**ECH:**	1.5		
Course Level:	☐ Gen Ed/IAI ☐ Baccalaureate/Non-IAI	☑ Career/Technical ☐ Dev Ed/Not in Degree Audit		**Clinical Practicum:**	0.0	**Work-based Learning:**	0.0	**WBL ECH:**	0.0		
Course PCS & CIP:	12 - 15.0405		**IAI Code:**	N/A				**Contact Hours (Minutes/Week)**			
Repeatable (Y/N):	N	**Pass/Fail (Y/N):** N	**Variable Credit (Y/N):** N	**Min:**		**Max:**		**16 Wks**	75	**8 Wks**	150
Prerequisites:	APT-053, APTC-053 or consent of the instructor										
Corequisites:	None										
Catalog Description: (40 Word Limit)	This course covers basic communication and advanced topics of PLC operation and programming. Topics include project creation analog I/O, math and data handling instruction, program flow and communication protocols. (Meets SACA Automation Specialist I C-216 credential.)										

List the Major Course Segments (Units)	Contact Lecture Hours	Contact Lab Hours	Clinical Practicum	Work-based Learning
Standard 216.1 Robot programming	3	4		
Standard 216.2 Robot communications	4	6		
Standard 216.3 Robot applications	5	10		
TOTAL	12	20	0	0

EVALUATION							
QUIZZES	☑	**EXAMS**	☑	**ORAL PRES**	☑	**PAPERS**	☑
LAB WORK	☑	**PROJECTS**	☐	**COMP FINAL**	☑	**OTHER**	☐

COURSE MATERIALS		
TITLE:	Introduction to Robots in CIM systems	
AUTHOR:	James A Rehg	
PUBLISHER:	Prentis-Hall	
VOLUME/EDITION/URL:		
COPYRIGHT DATE:	2003	

MAJOR COURSE SEGMENT	HOURS	LEARNING OUTCOMES
		The student will be able to:
Standard 216.1.1 Enter and interpret robot program with motion commands	2	Performance Indicators 1. Interpret a robot motion command. 2. Use a teach pendant to enter a robot motion command. Knowledge Indicators 1. Describe three types of robot motion commands (linear, joint, and circular). 2. Describe the parts of a robot motion command. 3. Describe the position configuration settings. 4. Describe operation of motion command speed settings. 5. Describe types of motion command terminations. 6. Describe the use of local and global points.

Standard 216.1.2 Enter and interpret robot program tool and user frame offset commands	1	Performance Indicators 1. Interpret a robot program tool offset command. 2. Interpret a robot program user frame offset command. 3. Use a teach pendant to enter a robot offset command. Knowledge Indicators 1. Describe the operation of the tool offset command. 2. Describe the operation of the user frame offset command.
Standard 216.1.3 Enter and interpret robot program data register commands	1	Performance Indicators 1. Interpret a robot program that uses a data register command. 2. Use a teach pendant to enter a robot register command. Knowledge Indicators 1. Define a data register. 2. Define direct and indirect data register addressing. 3. Describe the operation of the arithmetic data register instruction.
Standard 216.1.4 Enter and interpret robot program branching commands	1	Performance Indicators 1. Interpret a robot program that uses unconditional branching. 2. Interpret a robot program that uses conditional branching. 3. Use a teach pendant to enter a robot branching command. Knowledge Indicators 1. Describe the function of conditional and unconditional branching commands. 2. Describe the operation of the JMP and LBL commands. 3. Describe the operation of the CALL command. 4. Describe the operation of the Register IF command. 5. Describe the operation of the Select command.
Standard 216.1.5 Enter and interpret robot program looping and wait commands	2	Performance Indicators 1. Interpret a robot program that uses looping. 2. Interpret a robot program that uses a wait command. 3. Use a teach pendant to enter a robot looping and wait commands. Knowledge Indicators 1. Describe the function of looping commands. 2. Describe the operation of the For…Do loop. 3. Describe the operation of the Repeat loop. 4. Describe the operation of the While loop. 5. Describe the operation of the Wait command.
Standard 216.2.1 Interface and test discrete robot inputs and outputs	3	Performance Indicators 1. Interface and test robot digital input with an input sensor. 2. Interface and test robot digital output with solenoid. 3. Test safety-enhancing devices. Knowledge Indicators 1. Describe how input/output devices are wired to a robot. 2. Describe the operation of robot I/O forcing. 3. Describe how safety-enhancing devices are wired to a robot. 4. Describe how end effector I/O are wired to a robot.

Standard 216.2.2 Interface and test PLC I/O to robot controller	2	Performance Indicators 1. Interface and test robot discrete I/O to PLC I/O. 2. Interface and test robot to PLC modular I/O. Knowledge Indicators 1. Describe the operation of modular PLC I/O. 2. Describe how PLC discrete I/O are wired to robot I/O.
Standard 216.2.3 Enter and interpret robot programs that use discrete I/O	3	Performance Indicators 1. Interpret robot programs that use discrete I/O. 2. Interpret robot programs that use program condition monitoring. 3. Use a teach pendant to enter a robot discrete I/O commands. Knowledge Indicators 1. Describe two types of condition monitoring: program and system.
Standard 216.2.4 Connect and test robot Ethernet network communications	2	Performance Indicators 1. Connect and test a robot to Ethernet network connection. Knowledge Indicators 1. Describe robot Ethernet communications capabilities.
Standard 216.3.1 Enter and test a robot program Macro command	2	Performance Indicators 1. Enter and test a Macro command to operate an end effector. 2. Enter and test a Macro command to move to a position. Knowledge Indicators 1. Describe the operation of a robot macro. 2. Describe the Macro table and Macros screen. 3. Describe applications of macros. 4. Describe manual and automatic methods of executing a macro.
Standard 216.3.2 Develop and test a basic pick and place robot program	3	Performance Indicators 1. Develop and test a basic pick and place robot program that picks up parts from a feeder and places them on a conveyor. Knowledge Indicators 1. Describe the sequence of a pick and place operation. 2. Describe applications of pick and place robot programs. 3. Describe how to plan a motion path for pick and place with robot approach, avoidance and placement points.
Standard 216.3.3 Develop and test a machine load/unload robot program	3	Performance Indicators 1. Develop and test a machine load robot program that picks up parts from a feeder and places in a CNC machine. Knowledge Indicators 1. Describe the sequence of a robot machine load operation. 2. Describe applications of machine load robot programs. 3. Describe how to plan a motion path for machine loading with robot approach, avoidance and placement points.

Standard 216.3.4 Develop and test a basic assembly robot program	3	Performance Indicators 1. Develop and test a basic assembly robot program that picks up parts from a feeder and assembles parts using press fit. Knowledge Indicators 1. Describe the sequence of a robot mechanical assembly operation. 2. Describe applications of mechanical assembly robot programs. 3. Describe how to plan a motion path for assembly with robot approach, avoidance and placement points. 4. Describe types of assembly feeders: gravity, vibratory, etc.
Standard 216.3.5 Develop and test a basic gluing robot program	4	Performance Indicators 1. Develop and test a basic gluing robot program that applies a glue line on a part. Knowledge Indicators 1. Describe the sequence of a robot gluing assembly operation. 2. Describe applications of gluing assembly robot programs. 3. Describe how to plan a motion path for gluing with robot approach and application points. 4. Describe types of glue systems and end effectors.
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Outcomes*	Outcome Title	At the successful completion of this course, students will be able to:
Course Outcome 1	Motion Commands	Enter and interpret robot program with motion commands: offset, data registers, branching and looping commands.
Course Outcome 2	I/O Ethernet Commun	Interface and test robot I/O and Ethernet communications.
Course Outcome 3	Robot Macro Command	Enter and test a robot program Macro command.
Course Outcome 4	Robot Commands	Enter and test a robot program for pick and place, load and unload, parts assembly and gluing operations.
Primary Laker Learning Competency	Creative Thinking & Problem Solving: Students think creatively to solve problems.	
Secondary Laker Learning Competency	Communication: Students communicate through the exchange of information.	

**Course and program outcomes will be used in the software for outcomes assessment and should include at least 1 primary and 1 secondary Laker Learning Competency. Limit to 3-5.*