

9/3/2024

DATE



REQUIRED COURSE



ELECTIVE COURSE

TEC

DIVISION



NEW COURSE



REVISION

Lake Land College

Course Information Form

COURSE NUMBER:	APTC-056		TITLE: (30 Characters Max)		Smart Factory Systems 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 - 15.0406		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:	EET-086 or PLCC-056, EET-087 or PLCC-057 and APTC-053												
Corequisites:	None												
Catalog Description: (40 Word Limit)	Students will learn to operate a smart factory program safely, adjust and operate PLC-controlled automated pick and place system, gauging system, PLC-controlled indexing system and PLC-controlled sorting and queuing. (Meets SACA Automation Specialist I C-214 Smart Factory Systems 1 credential.)												

List the Major Course Segments (Units)	Contact Lecture Hours	Contact Lab Hours	Clinical Practicum	Work-based Learning
Standard 214.1 Apply smart factory system safety procedures	1	1		
Standard 214.2 Operate a smart factory	1	3		
Standard 214.3 Program, adjust, and operate a PLC-controlled automated pick and place system	1	3		
Standard 214.4 Program, adjust, and operate a PLC-controlled automated gauging system	1	2		
Standard 214.5 Program, adjust, and operate a PLC-controlled indexing system	1	2		
Standard 214.6 Program, adjust, and operate a PLC-controlled sorting and queuing conveyor	1	2		
Standard 214.7 Program, adjust, and operate a PLC-controlled servo robotic assembly system	1	2		
Standard 214.8 Program and operate a multiple station smart factory that uses discrete I/O and Ethernet handshaking	1	4		
TOTAL	8	19	0	0

EVALUATION

QUIZZES ☒	EXAMS ☒	ORAL PRES ☒	PAPERS ☒
LAB WORK ☒	PROJECTS ☐	COMP FINAL ☒	OTHER ☐

COURSE MATERIALS

TITLE:	E Learning materials
AUTHOR:	Amatrol
PUBLISHER:	
VOLUME/EDITION/URL:	
COPYRIGHT DATE:	

MAJOR COURSE SEGMENT	HOURS	LEARNING OUTCOMES
		<i>The student will be able to:</i>
Standard 214.1 Apply smart factory system safety procedures	2	Performance Indicator 1. Identify and correct smart factory system hazards. Knowledge Indicator 1. Define mechatronics, flexible manufacturing, and smart factory. 2. Describe PPE/safe dress for operation of smart factory systems. 3. Describe types of smart factory hazards. 4. Describe smart factory safety guidelines.

Standard 214.2 Operate a smart factory	4	Performance Indicator 1. Power up a smart factory. 2. Manually operate actuators to test input and output operation. 3. Make adjustments to actuators and sensors. 4. Operate a smart factory in single-step or manual mode. 5. Operate a smart factory in automatic mode. 6. Perform a normal shutdown of a smart factory. Knowledge Indicator 1. Describe six automated manufacturing processes. 2. Describe the role of a modern automated machine operator. 3. Describe the function of a basic operator panel. 4. Describe the operation of three categories of stop functions. 5. Describe guidelines for operation of smart factories.
Standard 214.3 Program, adjust, and operate a PLC-controlled automated pick and place system	4	Performance Indicator 1. Program and operate a PLC-controlled automated pick and place system. 2. Adjust vacuum level and vacuum switch setting. 3. Adjust actuator travel and linear bearings. Knowledge Indicator 1. Describe the operation/construction of vacuum generator and vacuum cup. 2. Describe the operation/construction of a vacuum switch. 3. Describe the operation/construction of linear bearings. 4. Describe the sequence of a PLC-controlled automated pick-and-place system. 5. Describe applications for automated pick and place systems.
Standard 214.4 Program, adjust, and operate a PLC-controlled automated gauging system	3	Performance Indicator 1. Program and operate a PLC-controlled automated go/no-go gauging system. 2. Test a PLC program that uses an ultrasonic sensor. 3. Adjust ultrasonic sensor position and trip points. 4. Adjust actuator travel of an electric linear axis. 5. Adjust a ball screw drive and clutch. Knowledge Indicator 1. Describe the operation/construction of an ultrasonic sensor. 2. Describe the operation/construction of a ball screw drive/clutch. 3. Describe the sequence of a PLC-controlled automated go/no-go gauging system. 4. Describe applications for automated go/no-go gauging systems.

Standard 214.5 Program, adjust, and operate a PLC-controlled indexing system	3	Performance Indicator 1. Program and operate a PLC-controlled stepper motor indexing system. 2. Enter and operate a PLC program that controls a stepper motor index table. 3. Adjust a thru-beam fork sensor. Knowledge Indicator 1. Describe the basic operation of a stepper motor/controller. 2. Describe the operation of a thru-beam fork sensor. 3. Describe the sequence of a stepper motor indexing system. 4. Describe applications for stepper motor indexing systems.
Standard 214.6 Program, adjust, and operate a PLC-controlled sorting and queuing conveyor system	3	Performance Indicator 1. Program and operate a PLC-controlled sorting and queuing conveyor system. 2. Adjust a flat belt conveyor. Knowledge Indicator 1. Describe the operation of a flat belt conveyor. 2. Describe the operation of a solenoid actuator. 3. Describe the sequence of a sorting and queuing conveyor system. 4. Describe applications for sorting and queuing conveyor systems.
Standard 214.7 Program, adjust, and operate a PLC-controlled servo robotic assembly system	3	Performance Indicator 1. Program and operate a PLC-controlled robotic assembly system. 2. Adjust a screw feeder. Knowledge Indicator 1. Describe the operation of automatic screw feeders. 2. Describe the sequence of a PLC-controlled robotic screw assembly system. 3. Describe applications for robotic screw assembly system.
Standard 214.8 Program and operate a multiple station smart factory that uses discrete I/O and Ethernet handshaking	5	Performance Indicator 1. Program and operate a PLC program that uses discrete I/O handshaking to communicate in a multiple-station smart factory system. 2. Program and operate multiple-station PLC programs with system halt, reset and stop functions. 3. Program and operate a PLC logic program that uses message instructions. 4. Program and operate PLC and robot programs that use Ethernet I/O handshaking to communicate in a multiple-station smart factory system. Knowledge Indicator 1. Describe the operation of discrete I/O handshaking in a multiple station smart factory system. 2. Describe the operation of multiple station smart factory PLC programs with system halt, reset, and stop functions. 3. Describe the operation of Ethernet PLC and robot I/O handshaking. 4. Describe the operation of PLC message instructions.
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Outcomes*	Outcome Title	At the successful completion of this course, students will be able to:
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Course Outcome 1	SACA 214.1	Standard 214.1 Apply smart factory system safety procedures.
Course Outcome 2	SACA 214.3	Standard 214.3 Program, adjust, and operate a PLC-controlled automated pick and place system.
Course Outcome 3	SACA 214.4	Standard 214.4 Program, adjust, and operate a PLC-controlled automated gauging system.
Course Outcome 4	SACA 214.5	Standard 214.5 Program, adjust, and operate a PLC-controlled indexing system.
Course Outcome 5	SACA 214.6	Standard 214.6 Program, adjust, and operate a PLC-controlled sorting and queuing conveyor system.
Course Outcome 6	SACA 214.7	Standard 214.7 Program, adjust, and operate a PLC-controlled servo robotic assembly system.
Course Outcome 7	SACA 214.8	Standard 214.8 Program and operate a multiple station smart factory that uses discrete I/O and Ethernet handshaking.
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.*