

10/3/2024

DATE

 REQUIRED COURSE  
 ELECTIVE COURSE

 DIVISION  
 NEW COURSE  
 REVISION

## Lake Land College

### Course Information Form

COURSE NUMBER:		PLC-051		TITLE: (30 Characters Max)			Variable Frequency Drive Sys.				
SEM CR HRS:	1	Lecture:		0.5	Lab:	1			ECH:	1.5	
Course Level:	<input type="checkbox"/> Gen Ed/IAI <input type="checkbox"/> Baccalaureate/Non-IAI		<input checked="" type="checkbox"/> Career/Technical <input type="checkbox"/> Dev Ed/Not in Degree Audit		Clinical Practicum:	0	Work-based Learning:	0	WBL ECH:	0	
COURSE PCS #	12 - 15.0303		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-046 or APTC-046										
Corequisites:	None										
Catalog Description: (40 Word Limit)	Students will gain skills in Variable Speed Drive operation, parameter editing, error handling, multi-speed programming, acceleration/deceleration control as well as basic VFD wiring and safety.										

List the Major Course Segments (Units)	Contact Lecture Hours	Contact Lab Hours	Clinical Practicum	Work-based Learning
Safety, personal responsibility and communication	1	1		
Use a keypad to operate an AC variable frequency drive (VFD)	1	1		
View and edit basic VFD parameters	1	2		
Interpret a PLC program that controls 2/3-wire VFD operation	2	2		
Operate and monitor a VFD	1	1		
Reset a VFD after an error occurs	1	1		
Program and operate a VFD for multi-speed operation	1	3		
Program and operate a VFD for acceleration, deceleration and braking	1	4		
<b>TOTAL</b>	<b>9</b>	<b>15</b>	<b>0</b>	<b>0</b>

#### EVALUATION

QUIZZES	<input type="checkbox"/>	EXAMS	<input type="checkbox"/>	ORAL PRES	<input checked="" type="checkbox"/>	PAPERS	<input checked="" type="checkbox"/>
LAB WORK	<input checked="" type="checkbox"/>	PROJECTS	<input checked="" type="checkbox"/>	COMP FINAL	<input checked="" type="checkbox"/>	OTHER	<input type="checkbox"/>

#### COURSE MATERIALS

TITLE:	Variable Frequency Drives: Installation & Troubleshooting! (Practical Guides for the Industrial Technician! Book 2)		
AUTHOR:	Gary Anderson		
PUBLISHER:	CreateSpace Independent Publishing Platform		
VOLUME/EDITION/URL:	1st edition		
COPYRIGHT DATE:	2013		

MAJOR COURSE SEGMENT	HOURS	LEARNING OUTCOMES
		<i>The student will be able to:</i>
Safety, personal responsibility, critical thinking and communication	2	1. Recognize and disable (Lock out /tag out) all power sources while wiring/unwiring a VFD. 2. Create a written plan prior to doing any work on a VFD. 3. Log any work done on the VFD. 4. Communicate verbally any work done in a clear concise manner.
Use a keypad to operate an AC variable frequency drive (VFD)	2	1. Verify that keypad input is enabled. 2. Use a keypad to manually operate an AC variable frequency drive, including changing speed and direction. 3. Perform a manual startup, drive enable, and normal shutdown of an AC VFD . 4. Describe the function of an AC VFD and give an application . 5. Describe types of variable speed AC drives, the basic operation of an AC VFD, the main parts of an AC VFD and the keypad menus of an AC VFD.
View and edit basic VFD parameters	3	1. Set VFD to factory default settings. 2. View and edit basic VFD parameters. 3. Define a VFD parameter. 4. Describe types of VFD parameters and how to interpret a VFD parameter code.

Interpret a PLC program that controls 2/3-wire VFD operation	4	<ol style="list-style-type: none"> <li>1. Interpret a PLC program that controls 2-wire VFD operation.</li> <li>2. Interpret a PLC program that controls 3-wire VFD operation.</li> <li>3. Interpret a VFD wiring schematic.</li> <li>4. Describe the operation 2 and 3-wire AC VFD, the wiring connections to an AC VFD</li> <li>5. Describe the I/O wiring connections to 2/3-wire operation AC VFD.</li> </ol>
Operate and monitor a VFD	2	<ol style="list-style-type: none"> <li>1. Enter and operate a PLC program that controls 2/3-wire VFD.</li> <li>2. Configure VFD parameters for 2 or 3-wire operation.</li> <li>3. Perform a normal startup and shutdown of a VFD/PLC system.</li> <li>4. Pause a VFD.</li> <li>5. Perform an emergency shutdown of a VFD.</li> <li>6. Describe the parameters required for 2 or 3-wire VFD operation and how VFD systems are paused.</li> <li>7. Describe the operation of an e-stop VFD circuit.</li> </ol>
Reset a VFD after an error occurs	2	<ol style="list-style-type: none"> <li>1. Interpret a VFD error code.</li> <li>2. Reset and restart a VFD after an error has occurred.</li> <li>3. Describe types of VFD error codes.</li> </ol>
Program and operate a VFD for multi-speed operation	4	<ol style="list-style-type: none"> <li>1. Program and operate an AC VFD using programmable preset speeds.</li> <li>2. Program and operate an AC VFD to provide low speed boost.</li> <li>3. Calculate Volts per Hertz ratio to determine motor speed.</li> <li>4. Program a variable speed AC drive to skip frequencies.</li> <li>5. Describe how frequency affects the speed on an AC induction motor, the output characteristics of a variable frequency drive and the effect of reflected wave voltage on AC motor operation.</li> <li>6. Describe how to reduce the effects of reflected wave voltage.</li> </ol>
Program and operate a VFD for acceleration, deceleration and braking	5	<ol style="list-style-type: none"> <li>1. Program and operate an AC VFD to accelerate a motor to its rated speed.</li> <li>2. Program and operate an AC VFD to decelerate a motor to a stop.</li> <li>3. Program and operate an AC VFD to provide S-curve acceleration.</li> <li>4. Program and operate an AC VFD to provide DC injection braking to a motor.</li> <li>5. Describe the operation of AC VFD ramping, how it is used and how an AC VFD can accelerate a motor past its rated speed.</li> <li>6. Describe S-curve acceleration and explain how it is used.</li> </ol>
24		

Outcomes*	At the successful completion of this course, students will be able to:
Course Outcome	Plan and communicate in verbal and written form any work to be done on a VFD system
Course Outcome	Operate a VFD in manual mode from the keyboard
Course Outcome	Program and operate a VFD for acceleration, deceleration and braking
Primary Laker Learning Competency	Creative Thinking & Problem Solving: Students think creatively and solve problems by successfully combining knowledge in new ways.
Secondary Laker Learning Competency	Communication: Students communicate effectively and appropriately 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.