10/31/2024 DATE

☑ REQUIRED COURSE
☐ ELECTIVE COURSE

TEC DIVISION

☑ NEW COURSE
☐ REVISION

Lake Land College

Course Information Form

COURSE NUMBER:	APTC-054		**TITLE:** *(30 Characters Max)*	Hydraulic Systems I							
SEM CR HRS:	1.5	**Lecture:**	1.0	**Lab:**	1.0	**ICCB Lab:**	1.0	**ECH:**	2.0		
Course Level:	☐ Gen Ed/IAI ☑ Career/Technical ☐ Baccalaureate/Non-IAI ☐ Dev Ed/Not in Degree Audit			**Clinical Practicum:**	0.0	**Work-based Learning:**	0.0	**WBL ECH:**	0.0		
Course PCS & CIP:	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**	100	**8 Wks**	200
Prerequisites:	None										
Corequisites:	None										
Catalog Description: (40 Word Limit)	This class is a hands-on introduction to basic hydraulic systems, including schematics, symbols, basic components, servicing and adjustments. (Meets Certified Industry 4.0 Automation Specialist I C-255 Hydraulic Systems 1 credential.)										

List the Major Course Segments (Units)	Contact Lecture Hours	Contact Lab Hours	Clinical Practicum	Work-based Learning
Standard 255.1 Apply hydraulic system safety procedures	1	1		
Standard 255.2 Start up and shut down a hydraulic system	1	1		
Standard 255.3 Monitor hydraulic system operation	1	1		
Standard 255.4 Interpret hydraulic schematics	2	2		
Standard 255.5 Connect and operate basic machine hydraulic components	2	2		
Standard 255.6 Connect and adjust flow control and needle valves	2	2		
Standard 255.7 Check and charge accumulator pressure	2	2		
Standard 255.8 Monitor performance of hydraulic system pressure and force	2	2		
Standard 255.9 Perform basic hydraulic system servicing	2	2		
TOTAL	15	15	0	0

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

COURSE MATERIALS		
TITLE:	Instructor supplied	
AUTHOR:		
PUBLISHER:		
VOLUME/EDITION/URL:		
COPYRIGHT DATE:		

MAJOR COURSE SEGMENT	HOURS	LEARNING OUTCOMES
		The student will be able to:
Standard 255.1 Apply hydraulic system safety procedures	2	Performance Indicators 1. Identify and correct hydraulic system hazards. Knowledge Indicators 1. Describe PPE and safe dress for operation of hydraulic systems. 2. Describe types of hydraulic system hazards. 3. Describe hydraulic system safety guidelines. 4. Define hydraulics and give applications.

Standard 255.2 Start up and shut down a hydraulic system	2	Performance Indicators 1. Perform startup and normal shutdown of a hydraulic power unit. Knowledge Indicators 1. Describe the operation/components of a hydraulic power unit. 2. Describe the basic operation of a fixed displacement gear pump. 3. Describe how hydraulic energy is generated and its characteristics. 4. Define hydraulic pressure and give SI and US customary units.
Standard 255.3 Monitor hydraulic system operation	2	Performance Indicators 1. Connect and read a hydraulic flow meter. 2. Connect and read a hydraulic pressure gauge. 3. Read a hydraulic reservoir temperature gauge. Knowledge Indicators 1. Describe SI and US Customary hydraulic flow measurement units. 2. Describe the operation of a hydraulic flow meter. 3. Describe the operation of a hydraulic pressure gauge. 4. State Pascal's law and explain its significance in fluid power. 5. Describe the effect of temperature on a hydraulic system.
Standard 255.4 Interpret hydraulic schematics	4	Performance Indicators 1. Interpret hydraulic schematics in NFPA/ISO symbols. Knowledge Indicators. 1. Describe the guidelines for drawing hydraulic schematics. 2. Describe the operation/construction of basic hydraulic components and circuits, including directional valves (2/3/4 way and 2-3 position), cylinders (single and double acting), motors, direct-acting and pilot-operated relief valves, pressure-reducing valves, accumulators, 2-stage directional control valves, pressure compensated flow control valves and filters. 3. Describe the NFPA/ISO hydraulic component schematic symbols.
Standard 255.5 Connect and operate basic machine hydraulic components	4	Performance Indicators 1. Operate a basic hydraulic valve circuit with manual operator. 2. Use hydraulic valve manual overrides to test actuators. 3. Connect/disconnect hydraulic hoses using quick-connect fittings. 4. Install a subplate-mounted hydraulic valve. Knowledge Indicators 1. Describe the operation of a hydraulic valve override. 2. Describe types of hydraulic conductors.

Standard 255.6 Connect and adjust flow control and needle valves	4	Performance Indicators 1. Connect and adjust flow control valves in meter-in and meter-out circuits. 2. Connect and adjust needle valve to control hydraulic actuator speed. 3. Connect and adjust a pressure-compensated flow control valve. Knowledge Indicators 1. Describe the operation of a needle valve and flow control valve. 2. Describe the operation of a pressure-compensated flow control valve. 3. Describe fluid power speed control circuits (meter-in, out, etc.). 4. Describe the factors that affect hydraulic actuator speed. 5. Calculate the flow rate required to achieve a given actuator speed.
Standard 255.7 Check and charge accumulator pressure	4	Performance Indicators 1. Charge an accumulator. 2. Check accumulator charge pressure. Knowledge Indicators 1. Describe how to determine accumulator charge pressure.
Standard 255.8 Monitor performance of hydraulic system pressure and force	4	Performance Indicators 1. Measure ΔP across a hydraulic component. 2. Identify factors that affect hydraulic actuator force. Knowledge Indicators 1. Calculate net force output of a cylinder. 2. Calculate torque output of a motor. 3. Describe types of resistance in a hydraulic system. 4. Explain the effect of oil compressibility on hydraulic system operation. 5. Describe the pressure-force-area formula.
Standard 255.9 Perform basic hydraulic system servicing	4	Performance Indicators 1. Check oil reservoir level. 2. Refill oil reservoir. 3. Check pressure drop across oil filter. Knowledge Indicators 1. Describe the operation of a hydraulic filter.
	30	

Outcomes*	Outcome Title	At the successful completion of this course, students will be able to:
Course Outcome 1	Hydraulic Safety Gui	Describe hydraulic system safety guidelines.
Course Outcome 2	Hydraulic Schematics	Interpret hydraulic schematics.
Course Outcome 3	Flow Ctrl Need Valv	Connect and adjust flow control and needle valves.
Course Outcome 4	Hydraulic Servicing	Perform basic hydraulic system servicing.
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.*