11/6/2023 DATE
☑ REQUIRED COURSE
☐ ELECTIVE COURSE

TEC DIVISION
☐ NEW COURSE
☑ REVISION

Lake Land College

Course Information Form

COURSE NUMBER:	IND-043		TITLE: *(30 Characters Max)*	Refrigeration Fundamentals							
SEM CR HRS:	3	Lecture:	2	Lab:	2					ECH:	4
Course Level:	☐ Gen Ed / IAI ☐ Baccalaureate /Non-IAI ☑ Career/Technical ☐ Dev Ed/ Not in Degree Audit			Clinical Practicum:	0	Work-based Learning:	0			WBL ECH:	0
COURSE PCS #	12 - 47.0201		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	200	8 Wks	400
Prerequisites:	None										
Corequisites:	None										
Catalog Description: (40 Word Limit)	This course covers the basic refrigeration cycle, as well as refrigeration components and types of refrigerants. Students work with tools and gauges, measure temperatures and pressures and practice refrigeration safety procedures.										

List the Major Course Segments (Units)	Contact Lecture Hours	Contact Lab Hours	Clinical Practicum	Work-based Learning
Heat, Temprature, Pressure	4	4		
Matter, and Energy	2	2		
Refrigeration and Refrigerants	6	6		
General Safety Practices	6	6		
Tools, Instrumentation and Equipment	4	4		
Fasteners	1			
Tubing, and Piping	7	8		
TOTAL	30	30	0	0

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

COURSE MATERIALS	
TITLE:	Refrigeration & Air Conditioning Technology
AUTHOR:	E. Silberstein, J. Obrzut, J Tomczyk, B. Whitman,B. Johnson
PUBLISHER:	Cengage
VOLUME/EDITION/URL:	9th
COPYRIGHT DATE:	2021

MAJOR COURSE SEGMENT	HOURS	LEARNING OUTCOMES
		The student will be able to:
Heat, temperature and pressure	8	1. Define temperature 2. Convert between the Fahrenheit and Celsius scales 3. Describe molecular motion at absolute zero 4. Define the British thermal unit 5. Describe heat flow between substances at different temperatures 6. Explain the transfer of heat by conduction, convection and radiation 7. Describe sensible heat, latent heat, and specific heat and provide examples of each 8. State atmospheric pressure at sea level 9. Explain why atmospheric pressure varies at different elevations 9. Describe the purpose and operation of a barometer 10. Explain inches of Mercury, psig, and psia as they apply to pressure measurements 11. Convert absolute pressures to gauge pressures and vice versa 12. Convert pressure readings in inches of Mercury to absolute pressures and vice versa

Matter and energy	4	1. Define matter 2. List the three states in which matter is commonly found 3. Explain the properties of each state of matter 4. Define density. explain the difference between mass and weight 5. Discuss Boyle's law 6. State Charles' law 7. Discuss the general law of perfect gas 8. Discuss Dalton's law as it relates to the pressure of different gases 9. Define specific gravity and specific volume 10. Explain the law of conservation of energy 11. State two forms of energy important to the HVACR industry 12. Explain how heat energy flows between substances at different temperatures 13. Explain how magnetism can be used to convert electrical energy to mechanical energy 14. Describe work and state the formula used to determine the amount of work done by performing a given task 15. Define horsepower
Refrigeration and refrigerants	12	1. Discuss applications for high-, medium- and low-temperature refrigeration 2. Describe the term ton of refrigeration 3. Describe the basic refrigeration cycle 4. Explain the relationship between pressure and the boiling point of water or other liquids 5. Describe the function of the evaporator or cooling coil 6. Explain the concept of superheat as it applies to the evaporator 7. Explain the purpose of the compressor 8. List three types of compressors normally used in residential and light commercial buildings 9. Discuss the function of the condenser 10. Explain the concept of subcooling as it applies to the condenser. 11. State the purpose of the metering device 12. List four characteristics to consider when choosing a refrigerant for a system 13. List the designated cylinder colors for three commonly used refrigerants 14. Discuss four commonly used refrigerants and their applications 15. Describe how refrigerants can be stored or processed while refrigeration systems are being serviced
General safety practices	12	1. Explain the importance of being aware of your surroundings at all times 2. Explain the importance of personal protective equipment (PPE) and provide six examples of such equipment 3. Describe and demonstrate proper procedures for working with and around pressurized vessels and systems 4. Describe the dangers associated with working on and around electricity 5. Explain what precautions a technician should take when working with or around electricity 6. Explain the importance of knowing proper first aid procedures 7. Describe and demonstrate the proper use and setup of two commonly used types of ladders 8. Explain the dangers associated with exposure to extreme temperatures and what can be done to reduce the potential for injury resulting from these dangers 9. Describe three common classifications used to describe fire extinguishers 10. Explain the acronym PASS as it refers to fire extinguisher use 11. Explain the dangers associated with working on or around rotating machinery

Tools, instrumentation and equipment	8	1. List three benefits of using the correct tool for the job 2. Explain how to determine if a screwdriver is properly sized for the screw to be turned 3. Explain how nut drivers differ from traditional straight slot and Phillips head screwdrivers 4. Explain the purpose of the universal joint in a socket wrench set 5. Explain the benefit of using a ball-tipped Allen wrench 6. List four types of hammers commonly used in the HVACR industry 7. List three types of general purpose pliers 8. List four hand tools commonly used in conjunction with electrical wiring 9. List three common types of hand saws used by HVACR field personnel 10. Explain the purpose of the pilot bit on a hole saw 11. Explain the purpose and uses of a chalk line 12. Explain the purpose of a fish tape. explain the benefits of battery-powered tools 13. Explain the differences between a reciprocating saw and a jigsaw 14. Describe the function of a digital multimeter (DMM)
Fasteners	1	1. Identify common fasteners used with wood 2. Explain how staples are used as fasteners in the HVACR industry 3. Identify common fasteners used with sheet metal 4. Identify and describe typical screw dimensions 5. Identify typical machine screw heads 6. Identify common fasteners used on hollow walls 7. Identify and describe fasteners used in masonry applications 8. Explain how threaded rod can be used to support HVACR equipment 9. Describe hanging and securing devices for piping, tubing and ductwork 10. Describe various pins, clamps, and rings that are commonly used as fasteners 11. Describe solderless terminals and screw-on wire connectors
Tubing and piping	15	1. Explain the purpose and importance of tubing and piping in the HVACR industry 2. List the different types of tubing used in heating, air-conditioning and refrigeration applications 3. Explain why some piping and tubing runs are insulated 4. Describe a refrigerant line set 5. Describe two common ways of cutting copper tubing 6. List procedures used for bending tubing 7. List five common heat sources used to solder and braze tubing 8. Discuss procedures used for soldering tubing 9. Discuss procedures used for brazing tubing 10. Describe two methods for making flared joints 11. State procedures for making swaged joints 12. Explain how a compression fitting is made 13. Describe procedures for preparing and threading steel pipe ends 14. List four types of plastic pipe and describe uses for each 15. Describe alternative, mechanical methods for joining pipe sections
	60	

Outcomes*	At the successful completion of this course, students will be able to:
Course Outcome	Describe the basic refrigeration cycle
Course Outcome	Perform a flare and swag on tubing successfully

Course Outcome	Braze tubing and fittings together successfully
Primary Laker Learning Competency	
Secondary Laker Learning Competency	

**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.*