Course Information Form (CIF)

Course Code: MFX 190

Course Title: C-209 Pneumatics Certification

Department: Applied Sciences and Technologies
PCS Code: 1.2 - Occupational/Technical Instruction
CIP Code: 47.0303
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 1-2-2
Credit Hour Distribution:

Lecture: 1	Lab: 2	Clinical: 0	**Total: 2**

General Course Information

Catalog Description

Study material and review as needed; access to the C-209 Certification test.

General Course Objectives

Complete industry C-209 Pneumatics certification.

Minimum Placement Levels

English	Reading	Math
Placement into ENG 098	Placement into CCS 098	Placement into MAT 059

Prerequisites

Credit in MFX 130, MFX 131, MFX 132, and MFX 133

Methods of Evaluation

10 quizzes.

Instructional Materials and Additional Supplies

Amatrol Course Code

Course Content

General Learning Outcomes (GLOs)

- Critical Thinking and Information Literacy: Students will demonstrate the ability to evaluate perspectives, evidence, and implications, and to locate, assess, and use information effectively.
- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Introduction to Pneumatics	1. Define pneumatics and give an application. 2. Describe the functions of basic components of a pneumatic system. 3. Define pneumatic pressure and give its units of measurement. 4. Describe how to read a pressure gauge. 5. Read a pneumatic pressure gauge. 6. Describe the function of a pneumatic schematic.	0.5	1	0
Pneumatic Power	1. Explain six pneumatic safety rules. 2. Describe the function of a pressure regulator valve and give an application. 3. Describe the operation of a pressure regulator and give its schematic symbol. 4. Connect and adjust a pressure regulator. 5. Describe the function of an air filter. 6. Describe the operation of an air filter and give its schematic symbol. 7. Drain a pneumatic filter.	0.5	1	0
Circuit Connections	1. Describe the function of a pneumatic quick-connect fitting and give its schematic symbol. 2. Connect a pneumatic hose that uses quick-connect fittings. 3. Describe the function of a tee and a cross and give their schematic symbols. 4. Use a tee to connect two circuit branches together. 5. Use a cross to connect three circuit branches together.	1	2	0
Basic Cylinder Circuits	1. Describe the function of a pneumatic cylinder and give an application. 2. Describe the operation of a double-acting pneumatic cylinder and give its schematic symbol. 3. Describe the function of a 5-port, 3-position pneumatic directional control valve (DCV) and give an application. 4. Describe the operation of a 5-port, 3-position pneumatic DCV and give its schematic symbol. 5. Describe how DCVs are classified. 6. Describe the function of a DCV schematic. 7. Connect and operate a double-acting pneumatic cylinder using a 3-position, manually operated DCV. 8. Design a multiple cylinder pneumatic circuit.	0.5	1	0
Single-Acting Cylinder Circuits	1. Describe the function of a single-acting pneumatic cylinder and give an application. 2. Describe the operation of a single-acting, spring-return cylinder and give its schematic symbol. 3. Describe the function of a 3/2 pneumatic DCV and give an application. 4. Describe the operation of a 3/2 pneumatic DCV and give its schematic symbol. 5. Connect and operate a single-acting pneumatic cylinder using a 3/2 manually operated DCV.	0.5	1	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Basic Motor Circuits	1. Describe the function of a pneumatic motor and give an application. 2. Describe the operation of a pneumatic motor and give its schematic symbol. 3. Connect and operate a uni-directional pneumatic motor using a 3-port, manually operated DCV. 4. Describe the function of a muffler and give its schematic symbol. 5. List three common pneumatic motor designs and explain where they are used.	0.5	1	0
Pneumatic Schematics	1. Describe the line symbols used with fluid power circuits. 2. Identify pneumatic symbols. 3. Describe seven basic rules for drawing pneumatic schematics. 4. Draw a pneumatic schematic from the actual circuit connections on the machine. 5. Connect a pneumatic circuit given a schematic. 6. Design a multiple actuator pneumatic circuit.	0.5	1	0
Pressure vs. Cylinder Force	1. Describe how to calculate the force output of an extending cylinder. 2. Calculate the extension force of a cylinder given its size and pressure. 3. Measure the force output of an extending cylinder. 4. Describe how to calculate the force output of a cylinder in retraction (pull). 5. Calculate the retraction force of a cylinder given its size and pressure. 6. Describe the two types of pneumatic cylinder loads. 7. Describe four forces that act against cylinder movement. 8. Determine the effect of different loads on cylinder operation.	0.5	1	0
Pneumatic Leverage	1. State Pascal's Law and explain its significance in pneumatics. 2. Explain how force is multiplied using Pascal's Law.	1	2	0
Pressure and Volume	1. Describe two methods of representing pressure. 2. Explain how air pressure is created in a pneumatic system. 3. State Boyle's Law and explain its significance. 4. Use Boyle's Law to calculate changes in pressure and volume.	0.5	1	0
Air Flow and Resistance	1. Explain how a pneumatic system creates air flow. 2. Describe two types of resistance in a pneumatic system. 3. Explain how Delta P describes pneumatic resistance and explain its importance. 4. Measure Delta P across pneumatic components. 5. Describe what determines the speed of a pneumatic actuator.	0.5	1	0
Air Flow Control and Measurement	1. Describe the main function of a pneumatic needle valve and give an application. 2. Describe the operation of a needle valve and give its schematic symbol. 3. Connect and operate a needle valve to control actuator speed. 4. Define air flow rate and give its units of measurement. 5. Convert air volumes at pressures to free air volumes. 6. Describe the function of a flow meter and give an application. 7. Describe the operation of a rotameter and give its schematic symbol. 8. Connect and read a flow meter.	0.5	1	0
Flow Control Valves	1. Describe the function of a pneumatic check valve and give an application. 2. Describe the operation of two types of pneumatic check valves and give their schematic symbols. 3. Connect and operate a check valve. 4. Describe the function of a flow control valve and give an application. 5. Describe the operation of a flow control valve and give its schematic symbol. 6. Connect and operate a flow control valve to control actuator speed. 7. Describe the effect of actuator load changes on flow control operation.	0.5	1	0

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Speed Control	1. Describe the operation of a meter-in flow control circuit and give an application. 2. Connect and operate a meter-in flow control circuit. 3. Describe the operation of a meter-out flow control circuit and give an application. 4. Connect and operate a meter-out flow control circuit. 5. Describe the operation of an exhaust port speed control and give an application. 6. Connect and operate an exhaust port speed control circuit. 7. Describe the operation of a pressure port speed control and give an application. 8. Connect and operate a pressure port speed control circuit. 9. Design speed control circuits. 10. Define independent speed control and give an application. 11. Design an independent speed control circuit.	0.5	1	0
Cam Valves	1. Describe the function of a pneumatic cam-operated valve and give an application. 2. Describe the operation of a pneumatic cam-operated DCV and give its schematic symbol. 3. Connect and operate a pneumatic cam-operated 4/2 DCV. 4. Connect and operate a pneumatic cam-operated 3/2 DCV.	0.5	1	0
Cam Valve Applications	1. Describe the operation of a two-speed pneumatic circuit using a cam valve. 2. Design a rapid traverse-slow feed pneumatic circuit. 3. Design a pneumatic circuit to sequence two cylinders. 4. Describe three methods of decelerating a pneumatic cylinder. 5. Connect and operate a cylinder deceleration circuit using power braking.	0.5	1	0
Two-Way Valves	1. Describe the function of two-way valves. 2. Describe the construction and operation of five types of two-way valves. 3. Connect and operate a two-way DCV.	0.5	1	0
Externally Piloted Valves	1. Describe the function of an externally air-piloted DCV and give an application. 2. Describe the function of a detent and give its schematic symbol. 3. Describe four types of pneumatic DCV construction. 4. Describe the operation of an externally air-piloted DCV and give its schematic symbol. 5. Design a pneumatic circuit that uses an externally air-piloted DCV.	0.5	1	0
Introduction to Air Logic	1. Define air logic and give two applications. 2. List four advantages and four disadvantages of air logic. 3. Describe the operation of an air logic cylinder sequence circuit. 4. Connect and operate a cam-operated sequence circuit.	0.5	1	0
Air Logic Design	1. Describe the function of a shuttle valve and give an application. 2. Describe the operation of a shuttle valve and give its schematic symbol. 3. Describe the operation of a pneumatic seal-in circuit. 4. Connect and operate an air logic circuit to control a reciprocating cylinder.	0.5	1	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Air Filtration	1. List four sources of compressed air contamination and explain their effects. 2. Describe the operation of three common filter elements. 3. Describe the function of a coalescing filter and give an application. 4. Describe the operation of a coalescing filter and give its schematic symbol. 5. Change an air filter element. 6. Explain how air filter elements are rated. 7. Measure filter element flow rate and pressure drop. 8. Describe how to select a filter for an application. 9. Select an air filter for an application.	1	2	0
Water Removal	1. Define dew point and relative humidity and explain their importance. 2. Explain how water condenses in a pneumatic system and its effect. 3. Describe air filter removal of free water. 4. Describe two methods of removing water vapor from a pneumatic system. 5. Describe the function of an aftercooler and give an application. 6. Describe the function of a dryer and give an application. 7. Describe the principle of operation of three types of dryers and give an advantage of each. 8. Describe the operation of a refrigeration type air dryer. 9. Describe the function of a pneumatic system trap. 10. Describe the operation of two types of pneumatic traps and give the schematic symbol of each.	1	2	0
Lubrication	1. Describe the function of air lubrication and list three lubrication methods. 2. Describe the function of a lubricator and give its schematic symbol. 3. Describe the operation of three types of pneumatic lubricators and give an application of each. 4. Describe the types of oils used in lubricators. 5. Connect, fill, and adjust a lubricator.	1	2	0
Servicing Pneumatic Components	1. Describe how pressure gauges are calibrated. 2. Describe how acrylic flow meters are cleaned. 3. Describe the importance of eliminating air leaks. 4. Describe how to locate air leaks. 5. Describe four common pneumatic component failures and their probable causes.	1	2	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
15	30	0