

2 DAYS PROGRAM

INDUSTRIAL PNEUMATIC & ELECTRO-PNEUMATIC SYSTEMS:

Design, Applications, and Troubleshooting

COURSE OBJECTIVES

Upon completion of this course, participant will be able to:-

1. Learn pneumatic air fundamentals including generation and distribution
2. Understand working principles of pneumatic and electro pneumatic components

WHO SHOULD ATTEND?

Mechanical, Electrical, Instrumentation and Process Engineers, Project Engineers, Maintenance Engineers and Supervisors interested to work in the field of Pneumatic, Automation and Process Control. The course will also definitely be beneficial for the all the other department people concerned with the plant operations, production, maintenance and safety. It could be also useful for the procurement and quality personnel.

TARGET AUDIENCE

Any maintenance technician, line technician, engineers, supervisors and anyone who is interested to understand Pneumatic can attend

REGISTER 3 FREE 1 SEAT

Date : 2 & 3 Dec 2026 (Wed & Thu)

**Venue : Dorsett Grand Subang Hotel,
Selangor**

**100% HRDC
Claimable**

COURSE OVERVIEW

COURSE INTRODUCTION

Pneumatic Air is used for many industrial applications including for actuators and valves, motors circuits etc. This course is designed to provide basic concepts and practical advice on how to Design Pneumatic & Electro – Pneumatic Circuits and use them for process automation of many units. The course covers fundamentals of pneumatics including the air compressor and properties of air, pneumatic and electro pneumatic components, and industrial applications of the same.

BENEFITS

At the end of the training program, participants will be able to:

- Understand what Automation is and describe how the need arises
- Understand the advantages and disadvantages of Automation
- Identify when and where to apply Automation
- Understand the basic fundamentals and physical principles of Electro Pneumatic
- Exposed to the various application fields of Electrical & Pneumatic
- Understand Basic fundamentals of Electrical and components used for a electrical control system for pneumatics
- Understand how electro Pneumatic system works with practical hands on wiring up relays with switches to activate the pneumatic valves.
- Understand the basic fundamentals and physical principles of Pneumatic
- Exposed to the various application fields of & Pneumatic
- Understand the wide range of Pure Pneumatic components used in various industries, their characteristics, functions, symbols and application of Pneumatics in their respective industries.
- Understand how electrical Pneumatic system works including electrical ladder design and components in Stamping Machine etc.
- Understand how to manage housekeeping and minor maintenance tools can reduce machine failures
- Identify and detect machine using checklist
- Maintain mechanical equipment in satisfactory operation condition
- Reduce down time for carrying out simple repairs and adjustment
- Reduce frequency of breakdowns by carrying out effective repairs
- Understand what is electricity, calculate, current, resistance and potential difference
- Recognize electrical components and circuit

COURSE CONTENT

MODULE 1 — INDUSTRIAL COMPRESSED AIR SYSTEM

- Instrument air and industrial compressed-air systems
- Types and basic operation of air compressors
- Air preparation and distribution systems
- Compressed-air quality and contamination
- FRL – Filter, Regulator & Lubricator
- Pressure setting and monitoring
- Air leakage identification and prevention
- Pneumatic symbols and circuit documentation
- **Practical: Inspect and set up an FRL unit and check air pressure**

MODULE 2 — PNEUMATIC COMPONENTS & SYSTEM OPERATION

- Major components of a pneumatic system
- Pneumatic actuators
- Pneumatic valves
- Pressure-control valves
- Flow-control valves
- Directional-control valves
- Check valves and shuttle valves
- Quick exhaust valves
- Port numbering and lettering
- ISO 1219 pneumatic symbols
- Understanding air flow and exhaust paths
- **Practical: Identify, connect and test pneumatic components**

MODULE 3 — PNEUMATIC VALVES & CONTROL

Pressure-Control Valves

- Pressure regulator
- Pressure relief valve
- Sequence valve

Directional-Control Valves

- 3/2 valves
- 5/2 valves
- 5/3 valves
- Manual, mechanical and pneumatic actuation
- Pilot-operated valves
- Solenoid-operated valves

Flow-Control Valves

- Meter-in control
- Meter-out control
- One-way flow-control valve
- Speed control of cylinders

Practical:

- Valve identification
- Valve connection
- Flow and pressure adjustment
- Cylinder speed control

MODULE 4 — PNEUMATIC ACTUATORS & APPLICATION

- Single-acting cylinders
- Double-acting cylinders
- Cylinder construction
- Cylinder force and pressure relationship
- Cylinder speed
- Cushioning
- End-position sensing
- Magnetic/reed cylinder sensors
- Cylinder mounting and alignment
- Common cylinder faults

Practical:

- Connect and operate single- and double-acting cylinders
- Adjust cylinder speed
- Test cylinder sensors

MODULE 5 — INTERMEDIATE PNEUMATIC CIRCUIT DESIGN

- Direct and indirect control
- Start/stop control
- Automatic and semi-automatic operation
- Sequential cylinder control
- OR logic
- AND logic
- Memory/latching circuits
- Time-delay applications
- Speed-control circuits
- Two-cylinder sequence control
- A+ / A– sequence
- A+ B+ B– A– sequence

Practical Circuit Exercises:

- Design pneumatic circuit from a sequence requirement
- Build circuit using trainer components
- Test and modify the circuit
- Identify circuit faults

COURSE CONTENT

MODULE 6 — ADVANCED PNEUMATIC CONTROL & TROUBLESHOOTING

- Pneumatic latching circuits
- Sequence control
- Automatic cycle operation
- Limit valve control
- Pilot control
- Pressure-dependent sequence
- Common pneumatic system failures
- Systematic troubleshooting procedure
- Reading pneumatic circuit diagrams

Practical Troubleshooting:

- Low/incorrect pressure
- Cylinder not moving
- Slow cylinder movement
- Cylinder moving in wrong direction
- Valve malfunction
- Air leakage
- Incorrect sequence

MODULE 7 — INTRODUCTION TO ELECTRO-PNEMATICS

- Difference between pure pneumatic and electro-pneumatic control
- Electrical control principles
- Basic control voltage: 24 VDC
- Push buttons
- Selector switches
- Emergency stop
- Limit switches
- Proximity sensors
- Reed switches
- Relays and contacts
- Solenoid coils
- Solenoid-operated directional valves

Practical Electrical Exercise

- Identify electrical control components
- Wire a basic 24 VDC control circuit
- Test NO and NC contacts
- Test relay coil and contacts using a multimeter
- Operate a solenoid valve electrically

MODULE 8 — RELAY CONTROL & ELECTRICAL LOGIC

- Basic relay construction and operation
- Relay NO, NC and COM contacts
- Relay contact numbering

- Control relay applications
- Relay sequence operation
- Electrical latching/seal-in circuit
- Start/Stop control
- Interlocking
- Electrical AND logic
- Electrical OR logic
- Relay-based cylinder control

HANDS-ON ELECTRICAL PRACTICAL

Participants will wire and test:

1. Start/Stop circuit
2. Relay self-holding circuit
3. Electrical interlocking circuit
4. Two-push-button AND circuit
5. Two-input OR circuit
6. Relay-controlled solenoid circuit
7. Emergency-stop circuit

MODULE 9 — LADDER DIAGRAM DESIGN & PRACTICAL WIRING

- Introduction to ladder diagrams
- Electrical symbols
- Power and control circuits
- Reading ladder diagrams
- Converting circuit requirements into ladder diagrams
- Relay logic
- Latching circuits
- Interlocking circuits
- Timer applications
- Sensor-controlled circuits

PRACTICAL WIRING

Participants will:

- Read a ladder diagram
- Draw a ladder diagram
- Select the correct electrical components
- Wire the control circuit
- Connect relay contacts
- Connect sensors
- Connect solenoid valves
- Test the complete circuit
- Rectify wiring faults

COURSE CONTENT

MODULE 10 — ELECTRO-PNEUMATIC SEQUENCE CONTROL

- Electrical control of pneumatic cylinders
- Solenoid-operated 5/2 valves
- Single-solenoid and double-solenoid valves
- Cylinder position sensing
- Limit-switch control
- Reed/proximity sensor control
- Relay sequence control
- Automatic cycle control
- Electrical latching
- Electrical interlocking

PRACTICAL APPLICATIONS

Exercise 1:

Start → Cylinder A extends → Cylinder A retracts

Exercise 2:

Start → A+ → B+ → B- → A-

Exercise 3:

Sensor-controlled automatic cycle

Exercise 4:

Two-cylinder sequence with electrical interlock

MODULE 11 — TROUBLESHOOTING & ELECTRICAL SAFETY

Pneumatic Troubleshooting

- FRL faults
- Pressure problems
- Air leakage
- Valve malfunction
- Cylinder problems
- Flow-control problems
- Incorrect sequence
- Contaminated air

Electrical Troubleshooting

- Blown fuse
- Open circuit
- Short circuit
- Loose connection
- Faulty push button
- Faulty relay
- Faulty solenoid coil
- Faulty limit switch
- Faulty sensor
- Incorrect wiring

Logical Troubleshooting Method

1. Observe → 2. Identify → 3. Isolate → 4. Measure → 5. Test → 6. Rectify → 7. Verify

Electrical Safety

- Isolation before working
- Lockout/Tagout awareness
- Control voltage identification
- Safe use of multimeter
- Electrical panel safety
- Emergency-stop function
- Pneumatic pressure isolation
- Stored-energy hazards

MODULE 12 — INTEGRATED PNEUMATIC & ELECTRICAL PRACTICAL APPLICATIONS

Practical Project 1 — Automatic Cylinder Control

Design and build a complete electro-pneumatic system:

24 VDC Control → Relay Logic → Solenoid Valve → Cylinder → Sensor Feedback

Practical Project 2 — Pick & Place System

- Cylinder A: Clamp/extend
- Cylinder B: Pick/place
- Sensor feedback
- Automatic sequence
- Electrical interlocking

Practical Project 3 — Filling Machine

- Product detection
- Cylinder operation
- Solenoid valve control
- Timer/relay sequence
- Automatic return

Practical Project 4 — Strainer/Filter Application

- Pneumatic actuator
- Directional valve
- Pressure control
- Sensor/limit switch
- Electrical control

COURSE CONTENT

FINAL HANDS-ON PRACTICAL

Participants are given a pneumatic sequence requirement and must:

1. Interpret the sequence
2. Select pneumatic components
3. Draw the pneumatic circuit
4. Design the electrical ladder circuit
5. Select relays and sensors
6. Wire the electrical control panel
7. Connect solenoid valves
8. Connect pneumatic tubing
9. Test the complete system
10. Troubleshoot intentionally introduced faults
11. Demonstrate automatic operation
12. Explain the troubleshooting process