Mineral Area College
Serving Communities Since 1922

Advanced Manufacturing Lab
North College Center

Mineral Area College
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Mineral Area College’s Advanced Manufacturing Lab offers state-of-the-art technical skills training. The manufacturing program is based on an integrated approach developed by Amatrol (selected lab vendor) that combines hands-on skills with strong curriculum for an outstanding learner experience. The program, developed in close partnership with industry, offers multiple levels of study, starting with the basics and building into more sophisticated technology applications. The lab provides hands-on skill training required by machine operators, maintenance personnel, machine technicians and those seeking to upgrade to these positions. The result is a job-ready, skills-based training system.

**ADVANCED MANUFACTURING SKILL AREAS:**
- Mechanical Drive Systems
- Fluid Power Systems
- Electrical Systems
- Programmable Controllers
- Process Control Systems

### Mechanical Drive Systems

#### Mechanical

**Level 1 Mechanical Drives**
- Chain & Belt Drives
- Motor Mounting
- Spur Gear Drives
- Soft Foot
- Basic Shaft Alignment
- Gear Trains

**Level 2 Mechanical Drives**
- Bushings, Idler Systems
- Heavy Duty Chain & Belt Drives
- Timing/HTD Belt Drives
- Variable Pitch Sheaves
- Reverse Indicator Shaft Alignment
- Lubrication

**Level 3 Mechanical Drives**
- Plain, Ball, Roller, Tapered Bearings
- Angular Contact Bearings
- Seals and Gaskets
- Miter, Helical & Worm Gears
- Gearboxes

**Vibration Analysis**
- Concepts & Measurement
- Baseline Readings
- Condition Monitoring
- Severity Charts
- Isolators
- Dampers

### Fluid Power Systems

#### Hydraulics

**Level 1 Hydraulics - Basic Hydraulics**
- Pumps/Cylinders/Motors
- Directional Control Valves
- Check, Relief & Pressure Reducing Valves
- Sequence & Flow Control Valves
- Hydraulic Circuit Applications

**Level 2 Hydraulics - Intermediate Hydraulics**
- Accumulators
- Pilot-Operated DCVs & Check Valves
- Flow Control Valves
- Direct-Operated Relief Valves
- Rapid Traverse Slow Feed Circuits
- Cylinder Sequencing - Cam-Operated DCVs
- Remote Pressure Control/Pump Unloading Circuits

**Level 3 Hydraulics - Advanced Hydraulics**
- Heat Exchangers
- Reservoirs/Filtration
- Fluid Conductors, Conditioning
- Motor & Pump Performance

#### Pneumatics

**Level 1 Pneumatics - Basic Pneumatics**
- Pressure, Force, Power, Work
- Pascal’s & Gas Laws
- Compressors
- Cylinders/Motors
- Directional, Check, Pressure & Flow Control Valves
- Filters/Regulators/Lubricators

**Level 2 Pneumatics - Intermediate Pneumatics**
- Cam & Pilot Operated Check Valves
- Cylinders/Shuttle Valves/Air Logic
- Water Removal Techniques
- Air Dryers/After-Coolers
- Water Traps/Air Lubricators

**Level 3 Pneumatics - Advanced Pneumatics**
- Pneumatics Cylinder Loads & Applications
- Quick Exhaust Valves
- Motor Loads/Air Bearings/Filtration
- Flow Measurement

**Level 4 Pneumatics - Troubleshooting**
- Air-Over-Oil Systems
- Pilot-Operated DCVs
- Rodless & JIC Tie-Rod Cylinders
- Subplate-Mounted & Sandwich Valves
- Cylinders/Shock Absorbers
- Vacuum Systems
- Lockout/Tagout
### Electrical Systems

#### Basic Electricity
- AC/DC Electricity Systems
  - Fundamentals
  - Electrical Measurement
  - Circuit Analysis
  - Inductance
  - Capacitance
  - Combination Circuits
  - Transformers

#### Motor Control
- Level 1 Electrical Motor Control
  - Ladder Diagrams
  - Control Relay Circuits
  - Control Relays/Manual Switches
  - Float, Limit, Pressure, Liquid Level Switches
  - Magnetic Motor Starters
  - Control Transformers
  - Lockout/Tagout

- Level 2 Electrical Motor Control
  - Motor Braking
  - Reduced Voltage Starting
  - Variable Frequency AC Drive
  - Electronic Sensors
  - Electronic Counters
  - SCR Speed Control

### Programmable Controllers

#### Level 1 Programmable Controllers
- Operation
- Programming
- System Troubleshooting
- PLC Motor Control
- Boolean Algebra/Logic
- Ladder Logic
- Discrete I/O Interfacing
- Timer Instructions
- Counter Instructions
- Event Sequencing
- Application Development
- Program Control

#### Level 2 Programmable Controllers
- Operation Configuration, Programming, Application, Troubleshooting, Math Commands, Message Displays for:
  - Analog I/O
  - ControlNet
  - EtherNet
  - Data Highway
  - Device Level Networks
  - PLC Operator Interface

### Process Control Systems

#### Level 1 Level/Flow Process Control
- Concepts and Safety
- Instrument Tags
- Piping & Instrumentation Diagrams (P&ID)
- Loop Controllers
- Final Control Elements
- Level Measurement
- Liquid Level Control
- Automatic Control
- Flow Measurement
- Control Loop Performance

#### Level 2 Smart Flow Transmitters
- Differential Pressure Flow
- Transmitters & Sensors

#### Level 3 Ultrasonic Liquid Level Control
- Ultrasonic Level Measurement
- Ultrasonic Level Sensor Calibration
- Level Control

### Renewable Energy Systems

#### Level 1 Solar Energy Systems
- Off Grid Array
- Battery Backup
- Inverters
- Charge Controllers
- Power Generation

#### Level 1 Wind Energy Systems
- Grid Tied Turbines
- Inverters
- Towers & Service
- Generator Maintenance
- Power Generation

#### Level 1 Biofuels Systems
- Alcohol Based Fuels
- Oil Based Fuels
- Biodiesel Processing
- Ethanol Processing
- Automated & Manual Processors
- Batch Processing
- Dry & Wet Washing Processing
- Algae Production

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Flexible Training Delivery

The LAP style curriculum supports teaching in almost any situation: open-entry/open-exit, traditional class lecture or blended situations. LAPs can be easily combined in different configurations to support industry short courses, cross-training needs, as well as advanced study.

- Single company programs are designed to the needs of a specific company
- Flexible scheduling helps ensure that employees on all shifts are covered
- Multi-company programs are tailored to include a variety of training activities that best serve the participants
- A 200 hour Industrial Maintenance Technology Program is available to prepare current employees to enter the maintenance field

Advanced Manufacturing Skills

Curriculum/Equipment

The curriculum is designed to support a wide array of learning styles. Theory and hands-on skills are interwoven in a modular framework through Learning Activity Packets (LAPs). LAPs are integrated study units that support just-in-time study skills through the presentation of theory immediately reinforced with hands-on application. Repetition, active problem solving and self-reviews all provide feedback to students to build confidence in the skills they develop. The lab equipment and curriculum are designed to teach increasing levels of troubleshooting and problem solving skills.

Learning systems feature heavy duty industrial-grade components similar to what students will see on the job. The range of component types spans what students will typically encounter in the workplace.

Contact Information

For more information about the lab or to set up training courses, contact the Director of Workforce Development at 573-518-2182 / 573-270-3542 or the Advanced Manufacturing Specialist at 573-518-2132.

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