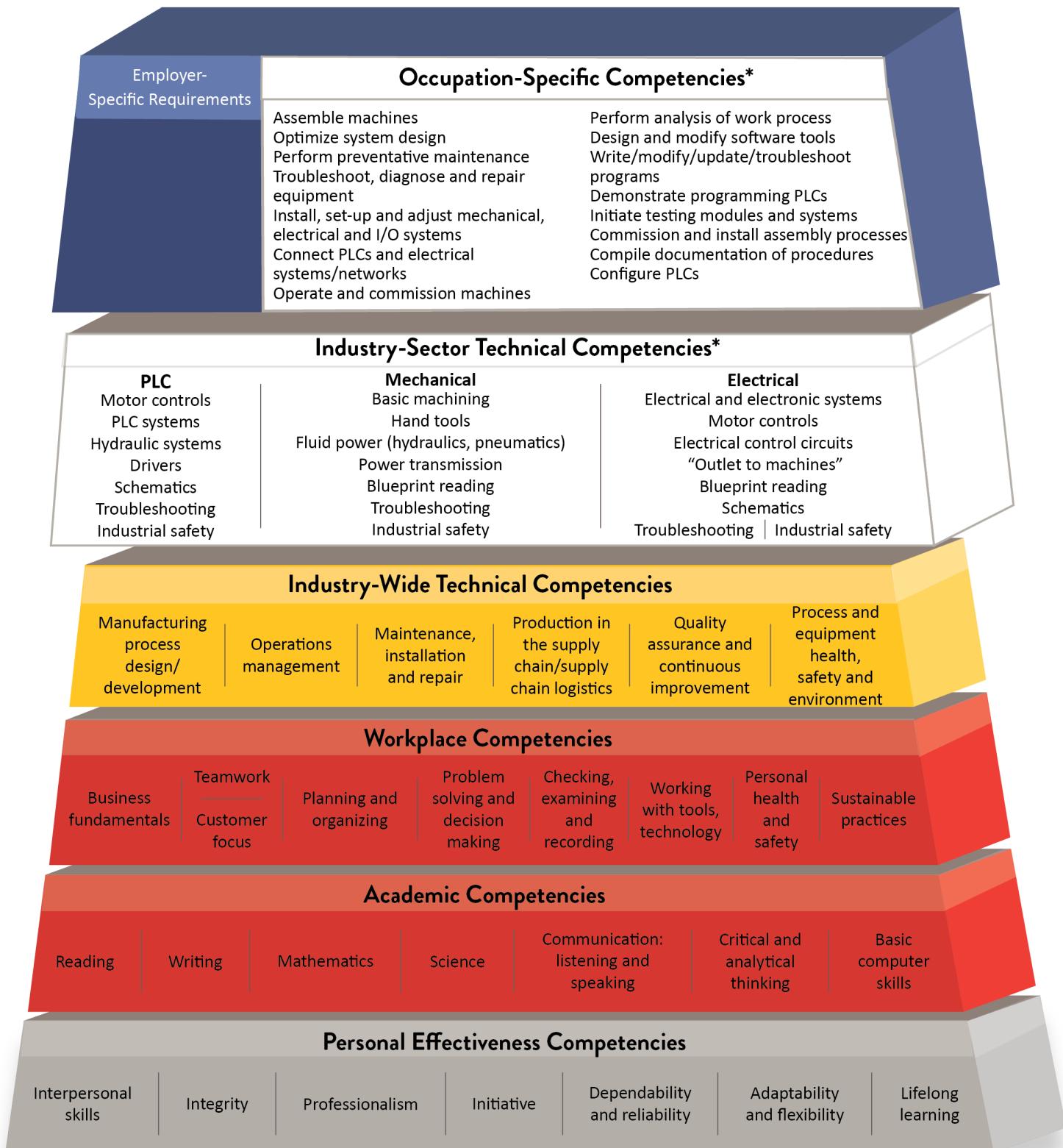


Minnesota Dual-Training Pipeline

Competency Model for Advanced Manufacturing

Occupation: Mechatronics Technician



Based on: Mechatronics Competency Model, Employment and Training Administration, United States Department of Labor, February 2025. For more detailed information about competency model creation and sources, visit dli.mn.gov/business/workforce/advanced-manufacturing.



Competency Model for Mechatronics Technician

Mechatronics Technician – An individual who works as a mechatronics technician requires electrical, mechanical and computer skills necessary to work on complex systems found in manufacturing environments. The work includes basic electricity, fluid mechanics, mechanical drives, instrumentation, motor control and task specific to electrical, mechanical, and control specialties. The skills involved include industrial maintenance and manufacturing including assembly, testing, startup, troubleshooting, repair and upgrades of machinery and associated control systems.

*Pipeline recommends the Industry-Sector Technical Competencies as formal training opportunities (provided through related instruction) and the Occupation-Specific Competencies as on-the-job (OJT) training opportunities.

Industry-Sector Technical Competencies

Related Instruction for dual training means the organized and systematic form of education resulting in the enhancement of skills and competencies related to the dual trainee's current or intended occupation.

PLC

- **Motor Controls** – Understand industrial motor control principles including installation, maintenance, and repair principles.
- **PLC systems** - Understand the functions and components of PLC systems to achieve desired outcomes.
- **Hydraulic systems** - Understand how hydraulic systems function and their applications and integration with PLCs.
- **Drivers** - Understand the components and applications of drivers to achieve desired outcomes.
- **Schematics** – Knowledge in properly reading schematics.
- **Troubleshooting** – Understanding how to troubleshoot PLC programs.
- **Industrial safety** – Understanding of how to work with equipment and tools in a manufacturing setting in a manner that ensures personal safety.

Mechanical

- **Basic machining** - Understand how to safely operate machinery and the theory behind machining functions.
- **Hand tools** – Understand when and how to safely use hand tools in machining processes.
- **Fluid power (Hydraulics/Pneumatics)** – Knowledge in operating, adjusting, servicing, and installing fluid power systems.
- **Power transmission** – Training in the function of power transmission and how to install, maintain and repair.
- **Blueprint reading** – Know how to interpret blueprints and use them to manufacture machines and parts.
- **Troubleshooting** - Training in use of tools and knowledge to repair machines and correct manufacturing issues.
- **Industrial safety** – Understanding of how to work with equipment and tools in a manufacturing setting in a manner that ensures personal safety.

Electrical

- **Electrical and electronic systems** – Understand how to safely operate, repair, and alter electrical units and electronic systems.
- **Motor controls** - Understand industrial motor control principles including installation, maintenance, and repair principles.
- **Electrical control circuits** - Learn how to safely operate and modify electrical control circuits.
- **“Outlet to Machines”** – Understand the theory of the electrical processes that happen from the electrical outlet to the machine.
- **Blueprint reading** – Know how to interpret blueprints and use them to build and repair machinery and electronic components.
- **Schematics** - Instruction in reading schematics and using them to build and repair machinery and electronic components.

- **Troubleshooting** - Training in use of tools and knowledge to repair electronics and machines.
- **Industrial safety** – Understanding of how to work with equipment and tools in a manufacturing setting in a manner that ensures personal safety.

Occupation-Specific Competencies

On-the-Job Training is hands-on instruction completed at work to learn the core competencies necessary to succeed in an occupation. Common types of OJT include job shadowing, mentorship, cohort-based training, assignment-based project evaluation and discussion-based training.

- **Assemble machines** – Know how to assemble machines given the proper tools, parts, and manuals. Understand how to connect wires and components for proper functionality.
- **Optimize system design** – Understand how to elevate system design to increase the efficiency of the machines/electronics and to decrease the cost of operation.
- **Perform preventative maintenance** – Know how to perform maintenance on machines and electronics to avoid potential technological breakdowns.
- **Troubleshoot, diagnose, and repair equipment** – Able to troubleshoot issues and perform repair work.
- **Install, set-up, and adjust mechanical, electrical, and I/O systems** – Understand how to safely and properly install, set-up and adjust mechanical, electrical, and Input/Output systems to ensure peak performance.
- **Connect PLCs and electrical systems/networks** – Know how PLCs and electrical systems/networks work together and be able to connect them together.
- **Operate and commission machines** – Know how to run machines with auxiliary equipment and PLCs using standards and documentation.
- **Perform analysis of work process** – Understand how to be able to evaluate and optimize work processes.
- **Design and modify software tools** – Learn how to design and modify pneumatic, hydraulic, and electrical circuits using modern software tools when appropriate.
- **Write/modify/update/troubleshoot programs** – Know how to create programs and execute the necessary maintenance and troubleshooting procedures for programs operating machines and electronics.

- **Demonstrate programming PLCs** – Demonstrate PLC programming knowledge including digital and industrial field buses.
- **Initiate testing modules and systems** – Understand how to perform test runs of modules and assembled systems.
- **Commission and install assembly processes** – Know how to commission and install the assembly to operationalize standards and respond to questions regarding machinery.
- **Compile documentation of procedures** – Be able to document procedures which represent work processes.
- **Configure PLCs** – Be able to configure all aspects of PLCs and associated control circuitry for correct machinery operation.

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