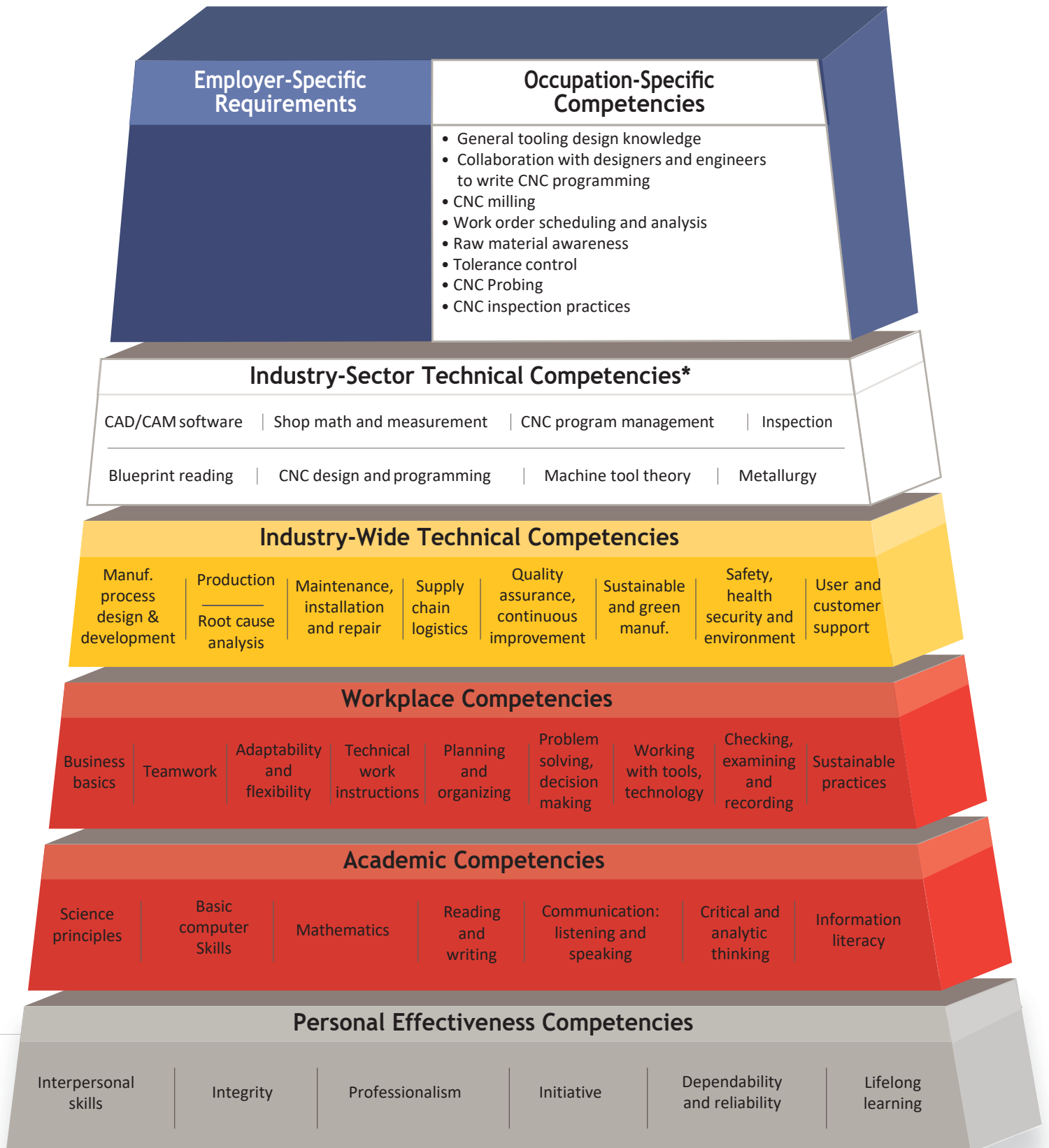


Minnesota Dual-Training Pipeline

Competency Model for Advanced Manufacturing

Occupation: Computer Numerical Control (CNC) Programmer



Based on: Advanced Manufacturing Competency Model Employment and Training Administration, United States Department of Labor, April 2010.

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

Competency Model for Advanced Manufacturing

Computer Numerical Control (CNC) Programmer

A Computer Numerical Control (CNC) Programmer assists in the design and production on CNC machines that shape parts from metal or plastic. They must create designs and interpret blueprints, manuals and other work instructions. They also study sample parts to determine dimensions of finished work pieces and equipment setup requirements. They help determine which tools will be the right ones for the CNC machine to use to ensure product reliability and machine shop efficiency. These professionals additionally detect malfunctions using precision measuring instruments such as micrometers, dial calipers, depth gages, indicators and scales.

Industry-Sector Technical Competencies

- CAD/CAM software -Use the models and assemblies created in CAD software to develop toolpaths that drive machine tools to turn designs into physical parts.
- Blueprint reading - Knowledge in reading and understanding industrial prints.
- Shop math and measurement – Training in basic math, including linear measurement, metrics and beginning algebra.
- CNC design and programming - Knowledge of manual programming of Computer Numerical Control (CNC) machine tools. Learn types of CNC controls, machinery, programming formats and basic terminology. The ability to hide G-code and/or have ways to bypass it in order to speed up the process of part design is also useful knowledge to have for this role as well.
- CNC program management - Knowledge of how to ensure that current software is up to date and aligns with shop needs. Able to also manage time and prioritize programming so that it meets company deadlines and order scheduling goals.
- Machine tool theory - Learn to complete the processes required for manufacturing a precision part, use standard shop safety practices, set-up and operate standard manufacturing machines, complete accurate lay-outs, explain applications of hand tools and use correctly and use basic measuring tools.
- Metallurgy - Know the basic principles of metals, the behavior of metals and the processes which affect them, as well as the most common metals used in industrial processes.
- Inspection – Knowledgeable of the proper methods and instruments used to effectively inspect parts in the shop, including using instruments such as the caliper, micrometer, and of course CNC machine.

Occupation-Specific Competencies

- General tooling design knowledge - Demonstrate knowledge of methods, and procedures for common machine shop benchwork and hand tool work as well as ability to do basic design and development of fixtures to support CNC machines.
- CNC Milling - Demonstrates the fundamentals of CNC machining processes with skills in work holding, speeds and feeds for various materials and functions and capabilities of CNC machining tools.

- CNC Probing - Ability to program software for probing tools to be able to maximize the efficiency, quality, and accuracy of CNC machine tools.
- Collaboration with designers and engineers to write programming - Demonstrates ability to write programs using CAD/ CAM software and the skill to collaborate with engineers and peers to develop CNC programming.
- Work order scheduling and analysis - Demonstrates ability to prioritize certain work orders over others to strive for efficiency in order to maximize CNC programming and machine output potential.
- Raw material awareness- Demonstrates knowledge of steel, aluminum, etc. and how they interact with the CNC and occasionally CMM machines.
- Tolerance control - Demonstrates knowledge of raw materials and how CMM and CNC machine use could potentially damage the materials. Takes steps to avoid damage to materials.
- CNC inspection practices - Demonstrate the proper methods and instruments used to effectively inspect parts in the shop, including using instruments such as the caliper, micrometer, and CNC.

CNC Programmer Occupational Training Plan

	List Course/Training Name and Title	Description of Courses and/or Training Program	List Responsible Provider: Company, College, Trainer, or other	Anticipated Completion Date
<i>Related Instruction Competencies</i>				
CAD/ CAM software				
Blueprint reading				
Shop math and measurement				
CNC design and programming				
Machine tool theory				
Inspection				
Metallurgy				
CNC program management				

<i>On-The-Job Training Competencies</i>				
General tooling design knowledge				
Collaboration with designers and engineers to write CNC programming				
Work order scheduling and analysis				
Raw material awareness				
Tolerance control				
CNC inspection practices				
CNC milling				
CNC probing				