

# Manufacturing: Machining

**Demonstrate knowledge of technology and materials** FA-MNMF01

**A Describe key material properties as they relate to machining efficiency** FA-MNMF01.A

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**B Explain material properties and tooling processes to created finished products** FA-MNMF01.B

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**C Describe the different types and uses of metal (e.g., ferrous metals, non-ferrous metals, high temperature metals and rare metals) and woods (e.g., hardwood, softwood)** FA-MNMF01.C

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**D Determine the hardness values of different materials** FA-MNMF01.D

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**E Explain types of tool wear and their consequences** FA-MNMF01.E

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**F Discuss which parameters to change to improve unfavorable tool failures and/or poor surface finish of parts** FA-MNMF01.F

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**Demonstrate ability to interpret blueprints and layout** FA-MNMF02

**A Examine and interpret engineering drawings to manufacture an object** FA-MNMF02.A

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**B Apply knowledge of engineering drawing to machining process** FA-MNMF02.B

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**C Use modern-day electronic systems to look up most current version of engineering drawings need for manufacturing** FA-MNMF02.C

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**D Define the information necessary to complete a machining task such as materials to be used, required surface finish, tolerances, quantity of units etc.** FA-MNMF02.D

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**E Distinguish between detail and assembly drawings** FA-MNMF02.E

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**F Use precision measuring and layout instruments and inspection processes to ensure quality of a finished product** FA-MNMF02.F

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**Demonstrate knowledge of machining operation and control** FA-MNMF03

**A Manage and coordinate the operation of the cutting pieces, feeds, and mounts associated with both manual and computer-numerical controlled (CNC) machining tools to complete advanced projects involving mills, lathes, and grinders** FA-MNMF03.A

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**B** Correctly, safely, and efficiently schedule, configure, administer, and verify heattreatments to machined parts according to blueprint specifications FA-MNMF03.B

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**C** Demonstrate the following higher functions: cutter diameter compensation; comfort with built-in risk management systems FA-MNMF03.C

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**D** Demonstrate how to inspect and assess the condition of tools and maintain them so that they are safe and operational FA-MNMF03.D

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**Demonstrate knowledge of machining production and processing** FA-MNMF04

**A** Describe and demonstrate various machining techniques including procedures on drill press, lathe, saw grinders, and milling machines FA-MNMF04.A

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**B** Solve manufacturing-related problems by analyzing and weighing the constraining factors including schedule, cost, materials, and equipment, as well as productivity, regulations, maintenance, and quality FA-MNMF04.B

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**C** Employ statistical quality control test methods and techniques, especially on large volume processes, to minimize defects and waste due to poor quality FA-MNMF04.C

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**Demonstrate knowledge of tool setup and required best-practices** FA-MNMF05

**A** Demonstrate tool and holder assembly with use height gage and pre-setter FA-MNMF05.A

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**B** Demonstrate tool and holder balancing to required standards FA-MNMF05.B

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**C** Follow best practices for assembly of tools using: Shrink Fit system, Collet systems, Weldon-Flats, and bold on systems FA-MNMF05.C

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**D** Rotate inserts on indexable cutting tools FA-MNMF05.D

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**Demonstrate ability to use CNC machines to manufacture parts** FA-MNMF06

**A** Produce parts to specifications or drawings provided on a computer numerical controlled mill or lathe FA-MNMF06.A

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**B** Employ basic G and M Programming focusing on the use of the Cartesian coordinate system and machine axis FA-MNMF06.B

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**C** Demonstrate methods by which programs can be entered into a controller FA-MNMF06.C

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**D** Demonstrate the setup and safe operation of a CNC turning or milling center FA-MNMF06.D

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**E** Demonstrate a tool change and tool selection to complete a multistep process on a CNC milling or turning center FA-MNMF06.E

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**F** Demonstrate operation and preventive daily maintenance of a CNC Lathe machine FA-MNMF06.F

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**G Demonstrate operation and preventive daily maintenance of a CNC Mill machine** FA-MNMF06.G

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**Apply quality control tools and techniques to manufacturing processes, systems, and products** FA-MNMF07

**A Analyze production controls and manufactured parts specifications using quality control techniques and precision measuring tools** FA-MNMF07.A

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**B Measure, weigh, and visually inspect machine parts, surface finish measurements** FA-MNMF07.B

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**C Use the appropriate instrumentation to measure tolerances as required in the engineering drawings** FA-MNMF07.C

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**D Apply data collection for part buyoff and related documentation** FA-MNMF07.D

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**E Validate that a provided part meets specifications from its engineered drawing by comparing specifications** FA-MNMF07.E

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**F Record and compare data to given project specifications; interpret results** FA-MNMF07.F

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**G Demonstrate ability to prove out a program using single block, lowered rapid rates, and using Distance to Go screen on control** FA-MNMF07.G

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**Describe knowledge of lifting devices** FA-MNMF08

**A Demonstrate safe use of lifting devices and rigging equipment (e.g., cranes, jibs, slings, magnets, specialized lifting devices)** FA-MNMF08.A

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**B Demonstrate ability to use lift trucks, stackers, pallet jacks for moving material** FA-MNMF08.B

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**Apply mathematical and measurement concepts to the machining process** FA-MNMF09

**A Select appropriate tools and accurately measure solid shapes and parts** FA-MNMF09.A

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**B Perform basic mathematical calculations and/or calibrations using tools such as micrometers, verniers, and gages** FA-MNMF09.B

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**C Calculate the speeds, feeds, and depth of cut for various machines and materials** FA-MNMF09.C

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**D Determine the appropriate units and record accurate and repeatable measures of length, diameter, and thickness to complete projects using appropriate tools** FA-MNMF09.D

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**E Apply principles of trigonometry, Cartesian geometry, and/or polar geometry, distinguishing which principles apply to a given machining tool and when** FA-MNMF09.E

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**F Use angle gages, a plate contractor, a universal bevel protractor with vernier scale, square and/or a sine bar and gage clocks or adjustable parallel** FA-MNMF09.F

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**G Determine the appropriate units and record accurate and repeatable measurement of material properties such as hardness, pH, and load elongation test curves of stress, strain, modulus and yield** FA-MNMF09.G

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**H Interpret test values and curves and use calculated results to make informed decisions** FA-MNMF09.H