Iowa CTE

Manufacturing

Students understand the planning and layout operations used in machine tool and materials forming processes. MNU1	1 **Interpret scaled machine tool and materials forming prints; gather design and materials information; perform calculations and use the detail to plan, lay out and produce parts or finished products that meet applicable standards.** MNU1.1
	2 **Understand the design parameters across machine tool and materials forming organizational levels.** MNU1.2
	3 **Use current information technology ideation and design process systems in the manufacturing of machined and formed parts and products.** MNU1.3
Students understand how materials can be processed through the use of machine tools, such as milling, drilling, turning and shaping machines and forming equipment, such as dies, presses and rolls. MNU2	1 **Understand the qualities of various raw and industrial materials and how these qualities affect the ability of the materials to be processed in the manufacturing of machined and formed parts and products.** MNU2.1
	2 **Use machine tools, such as machine lathes, milling machines, drilling machines, power hacksaws and band saws and forming equipment, such as presses, brakes, ironworkers and stake benches, to cut, shape, combine and form manufactured parts or use various methods for the assembly of machined and formed parts and products in manufacturing, such as thread cutting and bonding agents.** MNU2.2
Students understand various types of machine and forming assembly processes, such as flow, pressure, cold and adhesive bonding and mechanical fasteners. MNU3	1 **Select and use the tools, such as taps and dies, wrenches and spot welders, and the assembly process appropriate to the design criteria of a specific machined and formed product.** MNU3.1
Students understand finishing processes and the differences between various types of finishing materials used in the manufacturing of machined and formed parts and products. MNU4	1 **Understand and use processes such as dipping, plating, spraying and flow coating to finish machined and formed materials.** MNU4.1
	2 **Select and use appropriate machined- and formed-part finishing processes, such as coating, plating and anodizing to meet specific product design criteria.** MNU4.2

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Students understand the purposes and processes of inspection and quality control in machining and forming manufacturing processes. MNU5	1 **Know the reasons for inspection and quality control in the manufacture of machined and formed parts.** MNU5.1
	2 **Know how to perform a continuous online quality control inspection of machined and formed parts.** MNU5.2
	3 **Know how to troubleshoot performance problems of machining and forming systems.** MNU5.3
Students understand various machining and forming manufacturing systems that require standard hand and machine tools. MNU6	1 **Understand the characteristics of various machining and forming systems used in conventional manufacturing industries, such as open dies, smith forging, blow molding, stamping, drawing, shearing, chip removal, milling, turning and electrical discharge systems.** MNU6.1
	2 **Select and use appropriate machining and forming tools, equipment and inspection devices to manufacture parts or products.** MNU6.2
Students understand various machining and forming automated manufacturing systems, tool design, design for manufacturing, flexible manufacturing systems and materials resource planning. MNU7	1 **Understand materials and processes in relation to machining and forming manufacturing systems.** MNU7.1
	2 **Understand the processes involved in the following machining and forming manufacturing systems: “just in time,” tool design, design for manufacturing, flexible manufacturing systems and materials resource planning.** MNU7.2
	3 **Use computers to design and produce machined and formed products, write numerical control programs and control robots.** MNU7.3
Students understand various machining and forming manufacturing systems that require standard hand and machine tools. MNU8	1 **Manufacture parts or products from industrial materials by using machining and forming systems, such as electrical discharge, laser cutting, chemical machining and chemical bonding processes.** MNU8.1
	2 **Understand the importance of maintaining documentation for machining and forming systems.** MNU8.2
Students understand the operation and functions of machine tools in production and prototype work. MNU9	1 **Use various machine tools, such as lathes, mills, drills and saws, to produce parts and products.** MNU9.1
	2 **Select appropriate machining processes and equipment to produce prototypes or production parts or products.** MNU9.2
Students understand the operation and functions of machine tools in production and prototype work. MNU10	1 **Use various forming tools and equipment, such as rolls, brakes, dies and presses, to manufacture parts and products.** MNU10.1
	2 **Select appropriate tools, processes and equipment to successfully produce formed parts or products.** MNU10.2

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Students understand how a manufacturing company is organized and the elements of a machining and forming production management system. MNU11

1. **Understand corporate structures that affect machining and forming production.** MNU11.1
2. **Understand that a machining and forming production management system includes planning, engineering, organizing and controlling resources and manufacturing processes.** MNU11.2
3. **Know how scheduling, quality control, accident prevention and inventory control are used efficiently and appropriately in a machining and forming production management system.** MNU11.3