Name: _____ Machine Tool Technology (58.0501)

Directions:
Evaluate the student by checking the appropriate number to indicate the degree of competency.

Rating Scale (0-6):

- **0** **No Exposure** – no experience/knowledge in this area; program/course did not provide instruction in this area
- **1** **Unsuccessful Attempt** – unable to meet knowledge or performance criteria and/or required significant assistance
- **2** **Partially Demonstrated** – met some of the knowledge or performance criteria with or without minor assistance
- **3** **Knowledge Demonstrated** – met knowledge criteria without assistance at least once
- **4** **Performance Demonstrated** – met performance criteria without assistance at least once
- **5** **Repetitively Demonstrated** – met performance and/or knowledge criteria without assistance on multiple occasions
- **6** **Mastered** – successfully applied knowledge or skills in this area to solve related problems independently

0	1	2	3	4	5	6	**A. Appreciate and apply all personal and work place safety procedures**	**Notes:**
							1. Demonstrate appropriate work place safety practices (e.g., hand tools, power tools, fluid power, electrical, and environmental hazards)	
							2. Adhere to state and federal environmental/regulatory requirements/codes (e.g., OSHA and EPA)	
							3. Recognize when first aid is needed for occupational injuries and follow proper procedures	
							4. Identify types, purposes, and the operation of fire extinguishers and suppression resources	
							5. List machine shop safety rules and regulations	
							Other:	

0	1	2	3	4	5	6	**B. Perform machine tool related mathematical calculations**	**Notes:**
							1. Convert common fraction to decimal fraction and vice versa	
							2. Calculate measurement of right triangles	
							3. Determine tap drill size with formula and charts	
							4. Convert customary measurements to metric and vice versa	
							5. Use calculator to perform mathematical operations	
							6. Verify the accuracy of calculations derived with a calculator	
							7. Calculate amount of stock required	
							8. Calculate part and feature dimensions and locations	
							9. Convert revolutions per minute (rpm) to surface feet per minute (sfpm)	
							10. Calculate feeds and speeds	
							11. Determine tapers for machine set-up per formulas and charts	
							12. Determine sine bar set-up with formulas and charts	
							13. Perform angular and simple indexing calculations	

							Other:	

0	1	2	3	4	5	6	C. **Measure machined parts using industry recognized instruments**	**Notes:**
							1. Measure using direct-reading instruments (e.g., scales, protractors, and precision levels)	
							2. Measure using transfer instruments (e.g., plain inside and outside calipers, telescoping gages, adjustable hole gages, and adjustable parallels)	
							3. Measure using precision measuring instruments (e.g., micrometers, gage blocks, verniers, dial indicators, and digital calipers)	
							4. Measure using surface plate instruments (e.g., height gages, angle plates, and sine bars and plates)	
							5. Measure using comparison instruments (e.g., radius gages, squares, cutter tooth gages and center gages)	
							6. Measure using other instruments (e.g., optical comparators)	
							7. Measure pitch diameters using thread wires	
							8. Measure using unconventional methods (e.g., digital readouts on milling machines)	
							Other:	

0	1	2	3	4	5	6	D. **Interpret designs, drawings, and specifications**	**Notes:**
							1. Interpret blueprints including common drafting symbols	
							2. Make a sketch from a finished workpiece	
							3. Calculate tolerances and allowances	
							4. Calculate missing dimensions	
							5. Use geometric dimensioning and tolerancing	
							Other:	

0	1	2	3	4	5	6	E. **Plan work consistent with industry standards**	**Notes:**
							1. Use Machinery's Handbook to plan work	
							2. Plan sequence of part layout based on blueprint information	
							3. Identify cutting tool types (e.g., steel and carbide) and their applications (e.g., mills and lathes)	
							4. Plan sequence of machining operations	
							5. Plan tooling sequences for machining operations	
							6. Calculate machining operation, setup, and tear down times	
							Other:	

0	1	2	3	4	5	6	F. Inspect machined parts using industry standard tools/equipment	Notes:
							1. Inspect part using appropriate measuring instruments (e.g., scales, micrometers, verniers, and protractors)	
							2. Inspect part using surface plate instruments (e.g., indicators, height gages, angle plates, height-transfer gages, and sine bars and plates)	
							3. Inspect part using optical comparator	
							4. Inspect part using CMM (coordinate measuring machine)	
							Other:	

0	1	2	3	4	5	6	G. Collect and analyze quality control data	Notes:
							1. Follow a quality plan	
							2. Participate in capability study	
							3. Analyze the performance of a single-part production process	
							4. Analyze the performance of a production process	
							Other:	

0	1	2	3	4	5	6	H. Layout and fabricate bench work consistent with industry and safety standards	Notes:
							1. Cut materials with hand hack saw	
							2. Mark locations with prick and center punches	
							3. Locate holes with transfer screws and transfer punches	
							4. Bench file/deburr workpiece	
							5. Cut threads with die	
							6. Cut threads with hand tap	
							7. Ream holes with hand reamer	
							8. True and dress grinding wheels on pedestal/bench grinder	
							9. Grind and shape tools on pedestal/bench grinder	
							10. Use abrasives/whetting/polishing/lapping	
							11. Grind using appropriate hand grinder	
							12. Remove damaged screws	
							13. Remove broken drills and taps	
							14. Remove and install dowel pins	
							15. Install a thread insert	

							16. Straighten workpiece on arbor press	
							17. Assemble and disassemble workpiece with arbor press	
							18. Broach workpiece with broaching tool	
							19. Assemble and disassemble precision parts	
							Other:	

0	1	2	3	4	5	6	**I. Describe and conduct material sciences procedures**	**Notes:**
							1. Identify types of metals and related materials	
							2. List properties that affect machinability	
							3. Correlate types of materials to their properties	
							4. List major cutting tool variables	
							5. Perform heat treatment process	
							6. Test workpiece for hardness with and without hardness tester	
							7. Interpret time-temperature-transformation diagrams	
							8. Identify the effect of heat treatment on materials	
							Other:	

0	1	2	3	4	5	6	**J. Operate power saws consistent with industry and safety standards**	**Notes:**
							1. Perform power saw care and maintenance	
							2. Select blade type for sawing operations and materials	
							3. Cut and weld band saw blades	
							4. Select and set speeds and feeds on power saw	
							5. Cut material to length with power saw	
							6. Select and apply cutting fluids	
							7. Contour saw to scribed line	
							8. Saw internal contours with band saw	
							Other:	

0	1	2	3	4	5	6	**K. Operate drill presses consistent with industry and safety standards**	**Notes:**
							1. Perform drill press care and maintenance	
							2. Set up and clamp workpiece to drill press table	

							3. Select drill type based on job requirements	
							4. Determine cutting tool variables prior to use	
							5. Set up drill press according to calculated feeds and speeds	
							6. Select and apply cutting fluids	
							7. Drill holes to specification using manual and automatic feed	
							8. Countersink hole to specifications	
							9. Counterbore hole to specifications	
							10. Spotface to specific dimensions	
							11. Mount workpiece on V-blocks	
							12. Power ream hole to size	
							13. Use drill jigs and bushings	
							14. Hand tap hole using drill press	
							15. Tap hole with tapping attachments	
							16. Perform taper reaming and subsequent pipe tapping	
							17. Sharpen drills at a pedestal grinder or with grinding attachments and specialized grinders	
							18. Set up radial drill press	
							Other:	

0	**1**	**2**	**3**	**4**	**5**	**6**	**L.**	**Operate lathes consistent with industry and safety standards**	**Notes:**
							1.	Perform lathe care and maintenance	
							2.	Align lathe centers using test bar and dial indicators	
							3.	Select cutting tool based on job requirements	
							4.	Calculate feeds and speeds for lathe set-up	
							5.	Free-hand grind turning and facing tools	
							6.	Select and apply cutting fluids	
							7.	Operate lathe controls	
							8.	Face workpiece and center drill	
							9.	Set up tooling	
							10.	Turn workpiece between centers	
							11.	Indicate workpiece in four-jaw chuck	

							12. Drill, ream, bore, and countersink holes	
							13. Counterbore holes	
							14. Knurl parts	
							15. Free-hand grind 60-degree threading tool	
							16. Chase external/internal threads	
							17. Chase metric threads	
							18. Cut multiple lead threads	
							19. Cut Acme threads	
							20. Use compound rest to cut short external/internal tapered surfaces	
							21. Cut tapers by offset tailstock	
							22. Cut external tapered surface with taper attachment	
							23. Cut internal tapered surface with taper attachment	
							24. Align workpiece on faceplate	
							25. Perform lathe filing	
							26. Polish workpiece	
							27. Turn or thread long workpieces using follower and steady rest	
							28. Use form tooling	
							29. Use mandrel	
							Other:	

0	**1**	**2**	**3**	**4**	**5**	**6**	**M. Operate milling machines consistent with industry and safety standards**	**Notes:**
							1. Perform care and maintenance of milling machine	
							2. Tram (align) mill head	
							3. Select milling machine attachments according to job requirements	
							4. Align workpiece mounted on machine table	
							5. Calculate feeds and speeds and set up mill accordingly	
							6. Select and apply cutting fluids	
							7. Select cutting tool based on job requirements	
							8. Square up workpiece in milling vise using face mill	
							9. Mill workpiece with end mill	

							10. Locate work with edge finder	
							11. Drill holes with milling machine	
							12. Ream holes	
							13. Bore holes with milling machine	
							14. Use form cutter to mill workpiece	
							15. Machine workpiece mounted on V-blocks	
							16. Machine external straight keyway	
							17. Machine woodruff keyway	
							18. Mill simple and compound angles	
							19. Mill an external radius with rotary table	
							20. Mill an internal radius with rotary table	
							21. Mill workpiece using simple indexing operation	
							22. Use digital readout	
							23. Machine workpiece by straddle milling	
							24. Perform gang milling	
							Other:	

0	**1**	**2**	**3**	**4**	**5**	**6**	**N.**	**Operate grinders consistent with industry and safety standards**	**Notes:**
							1.	Perform grinder care and maintenance	
							2.	Select and apply cutting fluids	
							3.	Inspect and ring-test grinding wheel	
							4.	Balance grinding wheel	
							5.	Select and mount grinding wheel	
							6.	True and dress machine tool grinding wheel	
							7.	Grind workpiece on magnetic chuck using power feed	
							8.	Square up workpiece on surface grinder	
							9.	Indicate workpiece to be ground	
							10.	Dress form on grinding wheel	
							11.	Grind angular surfaces	
							12.	Grind straight and tapered surfaces between centers using cylindrical grinding	

							Other:	

0	1	2	3	4	5	6	**O. Fabricate and resurface cutting tools consistent with industry and safety standards**	**Notes:**
							1. Perform care and maintenance of tool-and-cutter grinder	
							2. Inspect and ring-test grinding wheels	
							3. Select and mount grinding wheel	
							4. True and dress grinding wheel	
							5. Set up machine	
							6. Sharpen cutters on tool-and-cutter grinders	
							Other:	

0	1	2	3	4	5	6	**P. Operate and maintain computerized numerical control (CNC) machines consistent with industry and safety standards**	**Notes:**
							1. Perform machine care and maintenance	
							2. Calculate coordinates and dimensions needed for CNC program	
							3. Write program for CNC machine	
							4. Set up a CNC machine	
							5. Machine workpiece with CNC machine	
							Other:	

0	1	2	3	4	5	6	**Q. Operate electric discharge machines (EDM) consistent with industry and safety standards**	**Notes:**
							1. Describe the electric discharge machine theory	
							2. Operate a wire electric discharge machine	
							3. Operate a plunge electric discharge machine	
							4. Operate a two-axis electric discharge machine	
							Other:	

0	1	2	3	4	5	6	**R. Demonstrate leadership skills in the classroom, industry, and society**	**Notes:**
							1. Demonstrate an understanding of SkillsUSA, its structure, and activities	
							2. Demonstrate an understanding of one's personal values	
							3. Perform tasks related to effective personal management skills	
							4. Demonstrate interpersonal skills	

							5. Demonstrate etiquette and courtesy	
							6. Demonstrate effectiveness in oral and written communication	
							7. Develop and maintain a code of professional ethics	
							8. Maintain an appropriate professional appearance	
							9. Perform basic tasks related to securing and terminating employment	
							10. Perform basic parliamentary procedures in a group meeting	
							Other:	

0	**1**	**2**	**3**	**4**	**5**	**6**	**S. Explain and demonstrate skills in a specialization area identified by the instructor**	**Notes:**
							1.	
							2.	
							3.	
							Other:	