### PROGRAM COMPETENCY PROFILE FOR CAREER TECHNICAL EDUCATION

**Career Cluster: Manufacturing**

**Program Name:** Machine Shop Technology/Assistant  
**CIP:** 480503  
**Effective 10/15**

| Competencies (statement that provides the overview and defines the instructional area) | Knowledge, Content and Skills (what a student needs to know and be able to do and upon which they will be assessed) | Common Core: College & Career Readiness Standards  
http://www.corestandards.org  
English Language Arts :ELA  
Mathematics: M | Rating Scale -Sample Performance Assessments (Performance tasks the student needs to demonstrate in order to be rated proficient in meeting the competency) |
|---|---|---|---|
| **Student will:** Understand the concepts, procedures, methods and practices related to safety in order to provide a safe work environment. | 1. Demonstrate, apply, and practice appropriate laboratory safety.  
**AAI 8.** Health, Safety, and Environment | **ELA:** 2, 4, 6, 9 | **For Example:**  
As the safety officer you are responsible for training all new employees. Your supervisor has asked you to design a safety manual to be used at all new employee training programs. You will create a draft manual and present it to your supervisor. Include #1 & 3 |
| | 2. Using standard procedures; demonstrate approved safe use of all basic hand tools used for precision machining processes (i.e., files, saws, tap and dies, fasteners, threads, hammers, scribes, etc.).  
**AAI 4.** Technical and Production Skills | **ELA:** 2, 6, 7 | **For Example:**  
You are a machine operator producing a metal part that develops a burr. To meet quality standards, you must select the proper tool to get rid of the burr. Use that tool safely to remove the burr. |
| | 3. Demonstrate, apply, and practice appropriate personal safety to industry best practices.  
**AAI 8.** Health, Safety, and Environment | **ELA:** 2, 4, 7 | **For Example:** |
| | 4. Recognize hazardous materials and interpret SDS and requirements, as well as related OSHA and DES standards. (Global Harmonizing System).  
**AAI 8.** Health, Safety, and Environment | **ELA:** 2, 4, 7, 8 | **For Example:**  
You have been hired as a new safety supervisor for Whelen Engineering. Your first task is to update the safety manual and make sure that all MSDS, SDS requirements are being met. |

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**All Aspects of Industry (AAI) | Career Ready Practices (CRP)**
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**National Standard:** Manufacturing Skill Standards Council  
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<td>Understand the concepts, procedures, methods and practices related to quality assurance.</td>
<td>5. Identify and be able to discuss the components of quality assurance concepts such as, LEAN &amp; 6SIGMA: group dynamics, 5S principles, push-pull.</td>
<td></td>
<td>For Example: You are a department supervisor who has been green belt trained. Your task is to teach your department about LEAN concepts through a power point presentation.</td>
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<td></td>
<td>6. Explain, discuss and apply personal ethics in the manufacturing industry.</td>
<td></td>
<td>For Example: As a new hire you have to attend the new hire orientation. The orientation is going to confirm the norms, do you show up on time and ready for work every day? Do you show respect to your supervisor, equipment, coworkers and the products you are producing? Are you striving for personal success as well as the success of the company you work for? <a href="http://smallbusiness.chron.com/manufacturing-code-ethics-46028.html">http://smallbusiness.chron.com/manufacturing-code-ethics-46028.html</a></td>
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<tr>
<td></td>
<td>7. Using standard procedures, demonstrate approved use of all basic measurement tools used for precision machining processes (i.e., indicators, micrometers, calipers, scales, tapes, etc.). AAI 4. Technical and Production Skills</td>
<td></td>
<td>For Example: You have been assigned to the quality control department you are faced with teaching a new employee the best practices in how to use appropriate precision measuring equipment to qualify random sample parts including non–conformance reports. Include #7 - 9</td>
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<td><strong>Mathematics (M)</strong></td>
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<td>8. Be able to identify and document defects (i.e. Non-conformance reports (NCR))</td>
<td>ELA: 2, 4</td>
<td>1 2 3 4</td>
<td>For Example: As an employee you must fill out a Non-conformance report (NCR) and be able to identify proper procedures for rejected part.</td>
</tr>
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<td>9. Discuss and explain the processes and procedures utilized to prevent defects in the machining/ manufacturing industry (i.e. foreign object debris (FOD), clean room practices, environmental factors, calibration)</td>
<td>ELA: 2, 4, 6, 9</td>
<td>1 2 3 4</td>
<td>For Example: Write a procedures manual on cleanroom practices which contains information on how to deal with environmental factors, foreign object debris, and proper procedures on how to calibrate the tools you are using.</td>
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| 10. Read and record basic precision measuring tools: micrometers to .0001 and digital calipers to .001. | ELA:2, 4, 7, 9  
M:9, 16, 19 | 1 2 3 4 | For Example: You are a machinist working with a blueprint that has various tolerances down .0001 and .001 you must apply the appropriate tool to measure the proper resolution of tolerance. Include #10-11 |
| 11. Identify common aspects of precision measuring including height gage, gage blocks, and precision dial indicator. Compare and Contrast common aspects of precision measuring (i.e.: dial calipers, sine plate, cmm, height gages, etc.) | ELA:2, 4, 7, 8, 9  
M: 9, 16, 19 | 1 2 3 4 | For Example: |

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| **Student will:** Understand the concepts, procedures, and processes in print reading and measurements to implement the proper mathematical calculations on the parts being manufactured | 12. Use triangulation to determine basic right angles within 1 degree of accuracy. (Discuss working knowledge of trigonometry). | ELA:2, 7, 8  
M:6, 8, 10, 12, 15 | 1 2 3 4  
For Example:  
You are a machinist. You must make sure the taper is straight and true according to blueprint specifications within the tolerances specified. Through use of decimal precision measuring tools, build a machine taper according to given specifications. Include # 12-14 |
| | 13. Read and interpret a 3-view orthographic projection print. Include knowledge and exposure to geometric dimensioning and tolerancing (GD&T) as well as design. | ELA:2, 4, 6, 7, 8, 9 | 1 2 3 4  
For Example: |
| | 14. Read and interpret a title block on a print to determine tolerances, materials, and other relevant information. | ELA:2, 6, 7, 8, 9 | 1 2 3 4  
For Example: |
| | 15. Identify and demonstrate basic concepts of CAD/CAM technology. **AAI 5.** Underlying Principles of Technology | ELA:2, 4, 6, 7, 8, 9 | 1 2 3 4  
For Example:  
You are a mechanical engineer. You are faced with the issue of making a part. Design the part to company specifications using CAD software. |

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| **Understand the basic properties and processes of various materials and in order to be able to select the proper tooling and machine set-up** | 16. Identify, discuss, and demonstrate basic material properties.                              | ELA:2, 4, 6, 7, 8                              | ![1 2 3 4] For Example:  
As a tool maker you are tasked to create a mold. You must select the appropriate materials and the heat treat process required to build the mold within the specifications. Include #16-19 |
|                                                                             | 17. Discuss the basic nomenclature of different materials in relation to the ASM Standards.    | ELA:2, 6, 7, 8, 9                              | ![1 2 3 4] For Example:                                                                                           |
|                                                                             | 18. Identify, discuss, and demonstrate basic heat treating processes and stress relieving, as well as the curing of composites. | ELA:2, 6, 7, 8, 9                              | ![1 2 3 4] For Example:                                                                                           |
|                                                                             | 19. Identify and list properties of basic ferrous, non-ferrous, and composite materials used by local industry. | ELA:2, 6, 7, 8, 9                              | ![1 2 3 4] For Example:                                                                                           |
| **Understand the concepts of basic operations and use of tools and equipment of the trade in order to select the proper equipment to produce the product** | 20. Identify and safely use various types of power cutting saws.                               | ELA:2, 4, 6, 7, 8, 9                           | ![1 2 3 4] For Example:  
As a machinist, you are to make a part that was designed. According to the specifications, you need to select the materials to make the part. Determine what particular saw should be used and what set-up procedures that need to be followed. Calculate the speed and feed rate to safely make the cut. Include #20-21 |
|                                                                             | M:1, 2, 4, 6, 8, 15                                                                           |                                               |                                                                                                                  |

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### Competencies

- **Knowledge, Content and Skills**
  - (what a student needs to know and be able to do and upon which they will be assessed)
  - [http://www.education.nh.gov/career/career/aaoi.htm](http://www.education.nh.gov/career/career/aaoi.htm)

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### Common Core: College & Career Readiness Standards

- **ELA:** http://www.corestandards.org
- **Mathematics:** M

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### Rating Scale - Sample Performance Assessments

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| Student will: | 21. Calculate feeds, speeds, proper tooling, and lubricants for safe machine operation, and select the appropriate tooling and lubricants based upon materials. | ELA:2, 4, 6, 7, 8, 9  
M:1, 2, 4, 6, 8, 15 | For Example: |

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| Student will: | 22. Identify, set up, and safely operate a drill press (operations include hole drilling, tapping, reaming, and countersinking). | ELA:2, 4, 7, 8  
M:1, 2, 4, 6, 8, 15 | For Example: |

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<td>Student will:</td>
<td>23. Set up and safely perform off-hand grinding (operations include tool bit sharpening, wheel dressing, and drill-bit sharpening).</td>
<td>ELA:2, 4, 6, 7, 8, 9</td>
<td>You are a machinist faced with the problem of a dull drill. Identify the correct wheel for the material of the drill you are grinding.</td>
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| Student will: | 24. Identify, set up, and safely operate a milling machine (operations include, but should not be limited to, edge milling, face milling, selection of proper speeds and feeds, proper work holding set ups such as vices, clamps, vacuum, magnets). | ELA:2, 4, 6, 7, 8, 9  
M:1, 2, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19 | For Example: |

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| Student will: | 25. Identify, set up, and safely operate a precision surface grinder (operations include wheel selection and precision grinding to .0001"). | ELA:2, 4, 6, 7, 8, 9  
M:2, 6, 8 | For Example: |

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<td>26. Identify, set up, and safely operate a lathe (operations include, but should not be limited to: turning, facing, threading, knurling, boring and selection of proper speeds and feeds).</td>
<td>ELA:2, 4, 6, 7, 8, 9 M:2, 6, 8</td>
<td>ELA:2, 4, 6, 7, 8, 9 M:2, 6, 8, 9, 10, 11, 12, 13, 14, 15</td>
<td>1 2 3 4 For Example: You are a machinist. Create a two-step cylinder meeting blueprint specifications of 1 inch and 1.5 inch.</td>
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<td>27. Write a CNC program; conversational and G and M code.</td>
<td>ELA:2, 4, 6, 7, 8, 9 M:2, 6, 8, 9, 10, 11, 12, 13, 14, 15</td>
<td>ELA:2, 4, 6, 7, 8, 9 M:2, 6, 8, 9, 10, 11, 12, 13, 14, 15</td>
<td>1 2 3 4 For Example: Your supervisor comes to you with a print. He has asked you to write a program appropriate to the machine tool. Include #27-29</td>
</tr>
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<td>28. Demonstrate application of Cartesian coordinates as applies to various machines.</td>
<td>ELA:2, 4, 6, 7, 8, 9 M:2, 6, 8, 9, 10, 11, 12, 13, 14, 15</td>
<td>ELA:2, 4, 6, 7, 8, 9 M:2, 6, 8, 9, 10, 11, 12, 13, 14, 15</td>
<td>1 2 3 4 For Example:</td>
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<tr>
<td>29. Demonstrate concepts of tool offsets on machining centers and turning centers (i.e., tool fixture, length, and radius).</td>
<td>ELA:2, 4, 6, 7, 8, 9</td>
<td>ELA:2, 4, 6, 7, 8, 9</td>
<td>1 2 3 4 For Example:</td>
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<td><strong>30. Identify application of basic nontraditional machining processes and their interactions (id: electronic discharge (EDM), laser, water jet, electrical chemical machining (ECM), direct metal laser sintering (DMLS)).</strong></td>
<td>As a machinist, you are faced with the problem of a broken tap. You must set up the EDM to remove the tap. Describe how this was accomplished safely to your supervisor.</td>
<td></td>
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<td><strong>AAI 5. Underlying Principles of Technology</strong></td>
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<td><strong>31. Discuss and / or demonstrate basic practices of acetylene welding and brazing of ferrous materials and the post and preheating materials associated with welding.</strong></td>
<td>As a machinist, you must drive an extremely deep hole. Your drill is not long enough. Explain the process for extending the drill by brazing an extension to achieve the proper depth.</td>
<td></td>
<td></td>
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<td><strong>32. Identify and /or demonstrate basic practices of MIG, TIG, and arc welding of ferrous materials.</strong></td>
<td>As the welding instructor, you receive broken items from other departments in the school. Select and use the appropriate welding materials to repair the stools from the science department.</td>
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<td>Understand the fundamental concepts of small business ownership and operations, as well as how small business impacts the economy</td>
<td>33. Discuss and assess business possibilities and identify the steps in planning a small business.</td>
<td>ELA: 2, 4, 5, 6, 7, 8, 9</td>
<td>For Example: You have decided that you want to open your own shop. You have made an appointment to meet with a small business representative to discuss the steps in developing a business plan. Include #34-35</td>
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<td></td>
<td>AAI 3. Finance</td>
<td></td>
<td></td>
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<td></td>
<td>34. Identify the resources needed for business startup and operation.</td>
<td>ELA: 2, 4, 5, 6, 7, 8, 9</td>
<td>For Example:</td>
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<td>35. Identify and discuss the traits and behaviors of a small business owner (skills, abilities, interests, personal assessment, and self-management).</td>
<td>ELA: 2, 5, 6, 7, 8, 9</td>
<td>For Example: You are taking a course at DEN Un. on entrepreneurship. An assignment is to interview a local business owner (sole proprietor, partnership, LLC, Franchise Owner, etc.). From the interview findings, you create a self-assessment chart and take the online assessment to test your entrepreneurial aptitude. <a href="http://www.forbes.com/sites/tompost/2012/06/04/are-you-an-entrepreneur-startup/">http://www.forbes.com/sites/tompost/2012/06/04/are-you-an-entrepreneur-startup/</a></td>
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Effective 10/15

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<thead>
<tr>
<th>Competencies (statement that provides the overview and defines the instructional area)</th>
<th>Knowledge, Content and Skills (what a student needs to know and be able to do and upon which they will be assessed)</th>
<th>Common Core: College &amp; Career Readiness Standards</th>
<th>Rating Scale -Sample Performance Assessments (Performance tasks the student needs to demonstrate in order to be rated proficient in meeting the competency)</th>
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<tbody>
<tr>
<td><strong>Student will:</strong> Understand the necessary career readiness and employability skills in order to achieve success in today’s workplace</td>
<td>36. Demonstrate personal growth, community leadership, democratic principles, and social responsibility by participating in activities/events offered through student and professional organizations.</td>
<td><strong>Common Core:</strong> English Language Arts :ELA</td>
<td><strong>Rating Scale:</strong> 1 = NO EXPOSURE; 2 = NOVICE (Information was covered in class, but student cannot demonstrate skill or knowledge without significant supervision); 3 = PROFICIENT (Student regularly demonstrates the knowledge or skill); 4 = MASTERY (Student demonstrates successful completion of this skill numerous times without supervision.)</td>
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<td><strong>Mathematics:</strong> M</td>
<td><strong>For Example:</strong> You have gone to your supervisor requesting a performance review due to the completion of additional trainings attended. The fact that you now have additional knowledge and skills, justifies why you should be promoted. Your supervisor has told you to review her calendar and schedule a meeting. Include #36 - 37</td>
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<td>37. Identify, discuss and demonstrate the skills to be an effective employee and contributing citizen (personal qualities, habits, attitudes, and social graces).</td>
<td><strong>ELA:</strong> 6, 7, 8, 9</td>
<td></td>
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**Key: Rating Scale:**
- 1 NO EXPOSURE; 2 = NOVICE (Information was covered in class, but student cannot demonstrate skill or knowledge without significant supervision); 3 = PROFICIENT (Student regularly demonstrates the knowledge or skill); 4 = MASTERY (Student demonstrates successful completion of this skill numerous times without supervision.)

**Common Core:**
- E=English/Language Arts (Reading, Writing, Research, Listening Speaking, Technology) | M=Mathematics (Numbers Quantity, Algebra, Functions, Geometry, Stat&Prob)

**All Aspects of Industry (AAI) | Career Ready Practices (CRP)**