Motorsports Technology II

8510 36 weeks / 280 hours

Table of Contents

Acknowledgments ......................................................................................................................................... 1
Course Description ........................................................................................................................................ 2
Task Essentials Table .................................................................................................................................... 2
Curriculum Framework ................................................................................................................................. 4
Applying Safety Practices ............................................................................................................................. 4
Interpreting Drawing and Welding Symbols ................................................................................................ 6
Using Tools................................................................................................................................................... 7
Demonstrating Gas Tungsten Arc Welding (GTAW) ................................................................................ 10
Demonstrating Manual Oxyfuel Gas Cutting (OFC) .................................................................................. 13
Applying Tools for Fabrication .................................................................................................................. 14
Assembling the Vehicle .............................................................................................................................. 17
Investigating Principles of Engines (OEM Production) .............................................................................. 18
SOL Correlation by Task ............................................................................................................................ 21
Entrepreneurship Infusion Units ................................................................................................................. 23
Appendix: Credentials, Course Sequences, and Career Cluster Information ............................................. 24

Acknowledgments

The components of this instructional framework were reviewed by the following curriculum development team members:

Lynnie Doughton, Owner, DRP Performance Products, Rocky Mount
Brian Munsey, President, Brian's Auto Wizard Incorporated, Roanoke
Greg McQuaid, Technical Sales Representative, Lincoln Electric Company, Leesburg
Douglas Newcomb, Teacher, Halifax County High School, Halifax County Public Schools
Charles Overfelt, Owner, Overfelt and Son Welding, Roanoke
Christopher Overfelt, Teacher, Burton Center for Arts and Technology, Roanoke County Public Schools
Kelly Powell, Owner, Powell Motorsports LLC, Roanoke
Brian Seate, Teacher, Halifax County Middle School, Halifax County Public Schools
Course Description

Suggested Grade Level: 11 or 12
Prerequisites: 8509

Motorsports Technology II further develops students' skills in race car fabrication as they explore the motorsports technology industry. Students gain experience in chassis preparation, vehicle assembly, and engine assembly and disassembly. Additional focus areas include racing protocol and regulatory compliance in the motorsports field.

As noted in Superintendent's Memo #058-17 (2-28-2017), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.

Task Essentials Table

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (●) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8510</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applying Safety Practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>⊕</td>
<td>Follow safety practices.</td>
</tr>
<tr>
<td>40</td>
<td>⊕</td>
<td>Perform housekeeping duties.</td>
</tr>
<tr>
<td>41</td>
<td>⊕</td>
<td>Demonstrate worker and lab safety.</td>
</tr>
<tr>
<td>42</td>
<td>⊕</td>
<td>Follow safety clothing and equipment guidelines.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8510</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Interpreting Drawing and Welding Symbols</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>□</td>
<td>Apply basic elements in a drawing or a sketch.</td>
</tr>
<tr>
<td>44</td>
<td>□</td>
<td>Fabricate simple parts from a drawing or a sketch.</td>
</tr>
<tr>
<td><strong>Using Tools</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>□</td>
<td>Demonstrate the use of a bead roller and the use of bead roller dies.</td>
</tr>
<tr>
<td>46</td>
<td>□</td>
<td>Demonstrate the use of a tubing bender.</td>
</tr>
<tr>
<td>47</td>
<td>□</td>
<td>Demonstrate the use of a tubing notcher (end-mill type notcher).</td>
</tr>
<tr>
<td>48</td>
<td>□</td>
<td>Demonstrate the use of an English wheel.</td>
</tr>
<tr>
<td>49</td>
<td>□</td>
<td>Demonstrate the use of automotive machining lab equipment.</td>
</tr>
<tr>
<td><strong>Demonstrating Gas Tungsten Arc Welding (GTAW)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>□</td>
<td>Describe the theories behind GTAW.</td>
</tr>
<tr>
<td>51</td>
<td>□</td>
<td>Perform safety inspections of all equipment and accessories.</td>
</tr>
<tr>
<td>52</td>
<td>□</td>
<td>Identify minor external repairs to all equipment and accessories.</td>
</tr>
<tr>
<td>53</td>
<td>□</td>
<td>Set up for GTAW operations and base metal preparation on ferrous and non-ferrous materials.</td>
</tr>
<tr>
<td>54</td>
<td>□</td>
<td>Operate GTAW equipment.</td>
</tr>
<tr>
<td>55</td>
<td>□</td>
<td>Perform 1F and 2F fillet welds on various materials.</td>
</tr>
<tr>
<td>56</td>
<td>□</td>
<td>Perform 1G-groove welds on carbon steel, limited thickness.</td>
</tr>
<tr>
<td>57</td>
<td>□</td>
<td>Perform 1F–2F welds on aluminum.</td>
</tr>
<tr>
<td>58</td>
<td>□</td>
<td>Perform 1G welds on aluminum.</td>
</tr>
<tr>
<td>59</td>
<td>□</td>
<td>Perform 1F–2F welds on stainless steel.</td>
</tr>
<tr>
<td>60</td>
<td>□</td>
<td>Perform 1G–2G welds on stainless steel.</td>
</tr>
<tr>
<td><strong>Demonstrating Manual Oxyfuel Gas Cutting (OFC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>□</td>
<td>Perform shape-cutting operations on carbon steel.</td>
</tr>
<tr>
<td>62</td>
<td>□</td>
<td>Perform bevel-cutting operations on plain carbon steel.</td>
</tr>
<tr>
<td>63</td>
<td>□</td>
<td>Remove weld metal from plain carbon steel, using weld washing techniques.</td>
</tr>
<tr>
<td><strong>Applying Tools for Fabrication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>□</td>
<td>Identify safety procedures.</td>
</tr>
<tr>
<td>65</td>
<td>□</td>
<td>Fabricate bare chassis or component parts.</td>
</tr>
<tr>
<td>66</td>
<td>□</td>
<td>Fabricate roll cage or component parts.</td>
</tr>
<tr>
<td>67</td>
<td>□</td>
<td>Estimate the cost of materials for a fabrication project.</td>
</tr>
<tr>
<td><strong>Assembling the Vehicle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>□</td>
<td>Demonstrate vehicle assembly safety procedures.</td>
</tr>
<tr>
<td>69</td>
<td>□</td>
<td>Prepare vehicle for pre-assembly.</td>
</tr>
<tr>
<td>70</td>
<td>□</td>
<td>Install components (e.g., fluid, wiring, safety, suspension, steering, braking, and drive-line).</td>
</tr>
<tr>
<td><strong>Investigating Principles of Engines (OEM Production)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>□</td>
<td>Demonstrate a cylinder leakage test.</td>
</tr>
<tr>
<td>72</td>
<td>□</td>
<td>Demonstrate the disassembly of an engine.</td>
</tr>
<tr>
<td>73</td>
<td>□</td>
<td>Examine engine wear and specifications.</td>
</tr>
<tr>
<td>74</td>
<td>□</td>
<td>Demonstrate the assembly of an engine.</td>
</tr>
<tr>
<td>75</td>
<td>□</td>
<td>Identify high-performance engine parts.</td>
</tr>
</tbody>
</table>
Curriculum Framework

Applying Safety Practices

Task Number 39

Follow safety practices.

Definition

Following safety practices should include wearing proper work attire, using eye and hearing protection, and adhering to equipment operation standards. It should also include following regulations and requirements of the U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), and American Welding Society (AWS) concerning the use, storage, and disposal of hazardous materials related to the motorsports industry. Correct applications, training, and penalties associated with each regulation/requirement, according to local ordinances and instructor's guidelines should be observed.

Process/Skill Questions

- When are safety glasses used?
- Why is it important to follow safety regulations?
- What do EPA, OSHA, and AWS stand for?
- What is the purpose of each organization?

Task Number 40

Perform housekeeping duties.

Definition

Performance should include organizing the lab (e.g., tools, work area, and storage) on a daily basis, according to customer service standards and customer and worker safety. It should also include managing supplies and inventory in an efficient manner.
Housekeeping duties should include

- keeping the duty station clean and safe for work
- keeping tools, workbenches, and manual equipment clean, maintained, and safe for work
- responding appropriately to safety hazards
- maintaining the cleanliness of the work area.

**Process/Skill Questions**

- Why is it important to maintain a clean and orderly work area?
- What are safety advantages that result from good housekeeping?
- How can good housekeeping improve one's overall work efficiency?

**Task Number 41**

**Demonstrate worker and lab safety.**

**Definition**

Demonstration should include

- wearing safety glasses at all times
- wearing clothing appropriate for the job or skill
- wearing personal protective equipment (PPE) when necessary
- following lab safety guidelines
- following instructor's rules and regulations.

**Process/Skill Questions**

- Why is PPE important?
- What are some types of PPE?
- Why is it important to follow instructor's and safety guidelines?

**Task Number 42**

**Follow safety clothing and equipment guidelines.**

**Definition**

Following safety clothing guidelines should include wearing the types of protective clothing and equipment required to protect the eyes, respiratory system, auditory functions, feet, hands, and body. It should also include taking grooming/hygiene precautions related to hair length, loose clothing, jewelry, greasy hands, shoes, or clothing, and avoiding dirty or scratched eye
protection. Guidelines should be followed in accordance with manufacturers' instructions and government regulations concerning hazardous materials and lab safety.

**Process/Skill Questions**

- What are the advantages of using protective clothing?
- Why are safety glasses needed in lab areas?
- Why are grooming/hygiene precautions important in lab areas?

**Interpreting Drawing and Welding Symbols**

---

**Task Number 43**

**Apply basic elements in a drawing or a sketch.**

**Definition**

Application should include proper line development, dimensions, and materials, in accordance with instructor's guidelines.

**Process/Skill Questions**

- What is the importance to having three views of the drawing?
- Why is it important to have tolerances on a drawing?
- What is the name of the most important line on the drawing? [object line]

---

**Task Number 44**

**Fabricate simple parts from a drawing or a sketch.**

**Definition**

Fabrication should include applying components (e.g., materials, dimensions, and machine application) in accordance with instructor's guidelines.

**Process/Skill Questions**

- What does the term *fabrication* mean?
• What is the importance of knowing the different types of materials used to fabricate components?
• What are some safety guidelines that should be followed in basic fabrication?
• Why is it important to fabricate parts from a drawing or sketch?
• What are the advantages of fabricating simple parts?

---

Using Tools

**Task Number 45**

**Demonstrate the use of a bead roller and the use of bead roller dies.**

**Definition**

Demonstration should include the following steps:

1. Secure the bead roller.
2. Select the material to be used.
3. Select the bead roller die.
4. Lay off the design.
5. Open up the bead roller and insert the metal.
6. Select the pressure.
7. Operate the bead roller.
8. Continue steps 5-7 until the design is complete.

**Process/Skill Questions**

• What is the purpose of a bead roller?
• When could one use a bead roller in motorsports technology?
• What are some of the safety issues involved with using a bead roller?

---

**Task Number 46**

**Demonstrate the use of a tubing bender.**
Definition

Demonstration should include the following steps:

1. Select the tubing size.
2. Select the tubing shoe and follower.
3. Set up the hydraulic pump and shoe.
4. Measure and write down the dimensions and draw the design.
5. Acquire a digital level and/or protractor, T-square, framing square, tape measure, and marking tools (i.e., scribe, magic marker, pencil).
6. Use a flat, level table.
7. Insert the tubing into the bender and bend to the pre-selected angle.
8. Continue step 7 until the tubing is bent according to the drawings.

Process/Skill Questions

• What other jobs can the tubing bender be used to perform?
• What safety issues are involved in operating a tubing bender?
• What condition should the tubing bender be in before one uses it?
• What is the maximum and minimum wall thickness that the tubing bender can bend?

Task Number 47

Demonstrate the use of a tubing notcher (end-mill type notcher).

Definition

Demonstration should include

• checking the notcher to ensure safe operation
• selecting the size of the end mill for tubing
• selecting the degree to be set
• adjusting the clamp all the way back
• placing the tubing into the clamp and tightening
• moving the clamped piece of tubing slowly toward the end mill
• returning the clamp to its starting position when the desired depth is obtained
• removing tubing and deburring
• checking the fit and recutting if necessary.

Process/Skill Questions
• What are some ways to use a tubing notcher?
• What are some safety problems that could occur when using a tubing notcher?
• What would happen if the end mill became loose?
• What sounds would be heard if the end mill became loose?
• How would a loose end mill affect the tubing?

Task Number 48

Demonstrate the use of an English wheel.

Definition

Demonstration should include

• selecting the material to be used
• selecting the wheel to be used
• determining the design to be used
• forming the material to the desired shape, using the shot bag and hammers
• using the wheel to smooth and shape the material.

Note: There are many excellent educational videos about using the English wheel.

Process/Skill Questions

• What safety problems should be considered when using an English wheel?
• What is an advantage of using an English wheel?
• What types of materials can be used on an English wheel?

Task Number 49

Demonstrate the use of automotive machining lab equipment.

Definition

Demonstration should include the different types of lab equipment encountered in the motorsports technology field according to manufacturers' specifications and instructor's guidelines, to include the following:
• valve resurfacer machine
• valve and seat grinder
• head resurfacing machine
• rod and pin bushing machine
• sonic tester
• crack detector
• valve guide measuring gauge
• precision valve resurfacer
• valve guide and seat machine
• valve grinding machine
• pressure testing equipment
• pressure washer or cleaning equipment
• camshaft bearing installation tools
• cylinder block and honing machine
• cylinder head displacement machine
• piston pin press
• cylinder boring machine
• rod and pin honing bench
• various types of equipment designed to perform specific tasks

Process/Skill Questions

• What are some safety measures that should be used when operating a valve resurfacer?
• What is the purpose of a valve resurfacer?
• How can automotive machining lab equipment be used in motorsports technology?

Demonstrating Gas Tungsten Arc Welding (GTAW)

Task Number 50

Describe the theories behind GTAW.

Definition

Description should include basic variations in GTAW.

Task Number 51
Perform safety inspections of all equipment and accessories.

Definition

Performance should include a visual inspection of the following GTAW equipment and accessories on a daily basis, in accordance with the instructor's or employer's policy:

- Regulator
- Hoses
- Welding leads (e.g., gun, torch, ground cable)

Task Number 52

Identify minor external repairs to all equipment and accessories.

Definition

Identification should include minor repairs to GTAW equipment and accessories (e.g., cups, coolant), in accordance with the manufacturers' recommendations, school policies, and the instructor's guidelines.

Task Number 53

Set up for GTAW operations and base metal preparation on ferrous and non-ferrous materials.

Definition

Setup should include

- following written or oral instructions or specifications
- using PPE
- selecting tungsten electrode, shielding gas, and filler material
- preparing tungsten electrode, shielding gas, and filler material
- adjusting polarity and current.
Task Number 54

Operate GTAW equipment.

Definition

Operation should include following the written or oral welding assignment.

Task Number 55

Perform 1F and 2F fillet welds on various materials.

Definition

Performance should include

- adherence to welding techniques
- filler rod selection
- torch angle
- material preparation
- use of hand tools.

Task Number 56

Perform 1G-groove welds on carbon steel, limited thickness.

Definition

Performance should be demonstrated in the flat position, according to the written or oral assignment, drawing, or specifications.

Task Number 57

Perform 1F–2F welds on aluminum.
Definition

Performance should be demonstrated in the flat position, according to the assignment, drawing, or op sheet specifications.

Task Number 58

Perform 1G welds on aluminum.

Definition

Performance should be demonstrated in the flat position, according to the assignment, drawing, or op sheet specifications.

Task Number 59

Perform 1F–2F welds on stainless steel.

Definition

Performance should be demonstrated in the flat position, according to the written or oral assignment, drawing, or specifications.

Task Number 60

Perform 1G–2G welds on stainless steel.

Definition

Performance should be demonstrated in the flat position, according to the written or oral assignment, drawing, or specifications.

Demonstrating Manual Oxyfuel Gas Cutting (OFC)
Task Number 61

Perform shape-cutting operations on carbon steel.

Definition

Performance should result in a shape cut to the written or oral assignment, drawing, or specifications.

Task Number 62

Perform bevel-cutting operations on plain carbon steel.

Definition

Performance should result in an edge cut to the written or oral assignment, drawing, or specifications.

Task Number 63

Remove weld metal from plain carbon steel, using weld washing techniques.

Definition

Removal should include

- using a cutting torch
- heating the metal until it is almost in a liquid state
- easing on the oxygen to blow away the melting steel.

Applying Tools for Fabrication

Task Number 64
Identify safety procedures.

Definition

Identification of safety procedures should include following manufacturer's suggested guidelines and instructor's rules and regulations in accordance with safety standards set forth by the industry.

Process/Skill Questions

- What safety procedures should be followed when using a hand-held grinder?
- What safety procedures should be followed when using an OFC?
- What safety procedures should be followed when using the PAC?

Task Number 65

Fabricate bare chassis or component parts.

Definition

Fabrication should include the following steps:

- Acquire the rules and safety regulations for the desired motorsports project.
- Determine the type of design of the project.
- Determine the amount of materials to be used.
- Use or make a scale drawing of design or make a scale model of the design (if applicable).
- Determine the best uses of materials.
- Cut and fabricate the materials to desired links.
- Lay out materials on a chassis fixture or table (if applicable).

Note: Do final welding of chassis or component parts as needed before the installation of sheet metal.

Process/Skill Questions

- What is the importance of understanding the rules and safety regulations of the desired project before beginning to fabricate a chassis?
- What are the types of skills you need to build a motorsports project?
- What are five safety issues that may occur when fabricating a chassis or component parts?
- What factors should be considered when placing the tack weld?
- Why is the correct size of spot weld important?
Task Number 66

Fabricate roll cage or component parts.

Definition

Fabrication of a roll cage should include the following steps:

- Select the type of materials to be used.
- Select the type and thickness of the roll cage to be used for the job.
- Determine the measurements and angles to be acquired.
- Cut and fabricate the cage to the desired links.
- Tack weld the roll cage to the chassis to meet the specifications in the desired motorsports project.
- Fabricate component parts as needed.

Note: Do the final welding of the roll cage or component parts as needed before the installation of sheet metal.

Process/Skill Questions

- What is the importance of understanding the rules and safety regulations of the desired project before beginning to fabricate roll cages?
- What are the types of skills you need to build a motorsports project?
- What are five safety issues that may occur when fabricating a roll cage or component parts?
- What factors should be considered when placing the tack weld?
- What is the importance of using the right type of roll cage material for the motorsports project?
- Why would the tubing being welded need to be purged? Why not?
- What cleaning process should be used before assembly?
- Why is the correct size of spot weld important?

Task Number 67

Estimate the cost of materials for a fabrication project.

Definition

Estimation should include

- listing and/or designing a motorsports project
- listing the materials to be used
- pricing the materials.
Process/Skill Questions

- What are some factors that could affect cost overrun on the motorsports project?
- Why is it important to keep accurate records?
- Why is it important to get more than one quote?
- Why are good communication skills important for this task?

Assembling the Vehicle

Task Number 68

Demonstrate vehicle assembly safety procedures.

Definition

Demonstration should include the identification of tools and equipment used in assembling a motorsports vehicle.

Process/Skill Questions

- Why is proper fit of tools to fasteners important?
- Why is proper protection of electrical wiring important?
- Why is proper routing of brake, fuel, lubrication, and coolant lines important?

Task Number 69

Prepare vehicle for pre-assembly.

Definition

Preparation should include

- making a checklist for pre-assembly
- gathering all necessary parts
- gathering all necessary tools and safety equipment.

Process/Skill Questions

- Why are checklists important?
• What are some tools that might be used?
• What are some safety tools that may be collected?

Task Number 70

Install components (e.g., fluid, wiring, safety, suspension, steering, braking, and drive-line).

Definition

Installation of components should include

• checking and securing the vehicle
• installing and identifying items (e.g., fluid, wiring, safety, suspension, steering, braking, and drive-line components) on the vehicle
• following the checklist sequence.

Process/Skill Questions

• How important is having a vehicle checklist for installing components?
• What safety issues occur when installing fluid lines?
• Who may be responsible for filling out the checklist?

Investigating Principles of Engines (OEM Production)

Task Number 71

Demonstrate a cylinder leakage test.

Definition

Demonstration should include

• selecting the tools and equipment needed to remove the spark plugs.
• removing the spark plugs.
• positioning the piston to top dead center.
• attaching air and setting gauge to zero.
• installing the tool and checking the percentage of leakage.
• testing all cylinders and recording the percentage of leakage.

Process/Skill Questions

• What is the purpose of the cylinder leakage tester?
• What can this test show about the engine?
• What could occur if the piston is not at top dead center?
• What safety items would be needed to perform the cylinder leakage test?

Task Number 72

Demonstrate the disassembly of an engine.

Definition

Demonstration should include

• installing the engine on the appropriate fixture
• removing all fluids and properly disposing of waste
• removing and identifying external parts (i.e., oil pan, valve covers, intake and exhaust manifolds, timing cover, and front harmonic balancer)
• removing and identifying rocker arms, push rods, and the cylinder head
• checking and numbering all rods and main caps in the correct order
• checking and removing timing components
• removing and identifying cam and lifters (If reusing cam and lifters, keep them in order.)
• removing and identifying the crankshaft.

Process/Skill Questions

• Why is it so important to number rod and main caps?
• What are some safety hazards involved in disassembling an engine?
• What could happen if the reused cam and lifters were not kept in proper order?

Task Number 73

Examine engine wear and specifications.
Definition

Examination should include

- checking the engine blocks and parts
- checking for manufacturer's specifications (OEM)
- checking piston-to-wall clearances
- checking rod and main bearing clearances
- checking valve-to-guide clearances.

Process/Skill Questions

- Why is it important to check rod bearing clearances?
- Why is it important to check main bearing clearances?
- What tools are used to check bearing clearances?

Task Number 74

Demonstrate the assembly of an engine.

Definition

Demonstration should

- checking for parts for the application.
- checking for the manufacturer's suggested clearances.
- checking block and head surfaces.
- installing the cam bearings.
- installing the freeze and gallery plugs.
- installing the camshaft.
- installing the crankshaft and rear seal.
- installing the timing components.
- installing the rod and piston assembly.
- installing the cylinder heads, push rods, and rocker arms.
- adjusting the rocker arms to manufacturer's specifications.
- torquing all bolts to manufacturer's specifications.
- adding lubricant.

Note: Recheck torque on all bolts before final assembly of oil pan, timing cover, and intake manifold.

Process/Skill Questions
• Why is it important to check bearing clearances?
• Why should you install the camshaft before the crankshaft?
• Why should bolts be torqued to manufacturer's specifications?

Task Number 75

Identify high-performance engine parts.

Definition

Identification could include

• camshaft
• pistons
• valves
• lifters
• rocker arms
• cylinder heads
• carburetor
• distributor
• push rods

to determine the effect on engine performance.

Process/Skill Questions

• What is the difference between a high-performance part and a regular part?
• How does a high-performance camshaft affect the performance of the engine?
• What is the connection between compression ratio and the octane of fuel?

SOL Correlation by Task

<p>| Follow safety practices.       | History and Social Science: GOVT.1, GOVT.9, GOVT.15 |
| Perform housekeeping duties.   | History and Social Science: GOVT.16                   |
| Demonstrate worker and lab safety. | History and Social Science: GOVT.9, GOVT.15, GOVT.16 |
| Follow safety clothing and equipment guidelines. | History and Social Science: GOVT.9, GOVT.16 |</p>
<table>
<thead>
<tr>
<th>Task</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply basic elements in a drawing or a sketch.</td>
<td></td>
</tr>
<tr>
<td>Fabricate simple parts from a drawing or a sketch.</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the use of a bead roller and the use of bead roller dies.</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the use of a tubing bender.</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the use of a tubing notcher (end-mill type notcher).</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the use of an English wheel.</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the use of automotive machining lab equipment.</td>
<td></td>
</tr>
<tr>
<td>Describe the theories behind GTAW.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>Perform safety inspections of all equipment and accessories.</td>
<td></td>
</tr>
<tr>
<td>Identify minor external repairs to all equipment and accessories.</td>
<td></td>
</tr>
<tr>
<td>Set up for GTAW operations and base metal preparation on ferrous and non-ferrous materials.</td>
<td></td>
</tr>
<tr>
<td>Operate GTAW equipment.</td>
<td></td>
</tr>
<tr>
<td>Perform 1F and 2F fillet welds on various materials.</td>
<td></td>
</tr>
<tr>
<td>Perform 1G-groove welds on carbon steel, limited thickness.</td>
<td></td>
</tr>
<tr>
<td>Perform 1F–2F welds on aluminum.</td>
<td></td>
</tr>
<tr>
<td>Perform 1G welds on aluminum.</td>
<td></td>
</tr>
<tr>
<td>Perform 1F–2F welds on stainless steel.</td>
<td></td>
</tr>
<tr>
<td>Perform 1G–2G welds on stainless steel.</td>
<td></td>
</tr>
<tr>
<td>Perform shape-cutting operations on carbon steel.</td>
<td></td>
</tr>
<tr>
<td>Perform bevel-cutting operations on plain carbon steel.</td>
<td></td>
</tr>
<tr>
<td>Remove weld metal from plain carbon steel, using welding techniques.</td>
<td></td>
</tr>
<tr>
<td>Identify safety procedures.</td>
<td></td>
</tr>
<tr>
<td>Fabricate bare chassis or component parts.</td>
<td>Mathematics: G.3</td>
</tr>
<tr>
<td>Fabricate roll cage or component parts.</td>
<td>Mathematics: G.3</td>
</tr>
<tr>
<td>Estimate the cost of materials for a fabrication project.</td>
<td>History and Social Science: GOVT.9, GOVT.15, GOVT.16</td>
</tr>
<tr>
<td>Demonstrate vehicle assembly safety procedures.</td>
<td></td>
</tr>
<tr>
<td>Prepare vehicle for pre-assembly.</td>
<td></td>
</tr>
<tr>
<td>Install components (e.g., fluid, wiring, safety, suspension, steering, braking, and drive-line).</td>
<td></td>
</tr>
<tr>
<td>Demonstrate a cylinder leakage test.</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the disassembly of an engine.</td>
<td></td>
</tr>
<tr>
<td>Examine engine wear and specifications.</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the assembly of an engine.</td>
<td></td>
</tr>
<tr>
<td>Identify high-performance engine parts.</td>
<td></td>
</tr>
</tbody>
</table>
Entrepreneurship Infusion Units

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked “optional.”
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)
- Core: Introductory Craft Skills Entry-Level Assessment
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- Flux Core Arc Welding (FCAW) Examination
- Gas Metal Arc Welding Examination
- Gas Tungsten Arc Welding (GTAW) Examination
- National Career Readiness Certificate Assessment
- Professional Communications Certification Examination
- SENSE Training Program Certification Examination (Level 1, Entry-Level Welder)
- Shielded Metal Arc Welding (SMAW) Examination
- Welding Assessment
- Welding Examination
- Welding Level One Entry-Level Assessment
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Motorsports Technology I (8509/36 weeks, 140 hours)

Career Cluster: Transportation, Distribution and Logistics

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility and Mobile Equipment Maintenance</td>
<td>Automotive Body and Related Repairer</td>
</tr>
<tr>
<td></td>
<td>Automotive Service Technician, Mechanic</td>
</tr>
<tr>
<td></td>
<td>Electrical and Electronic Installer</td>
</tr>
<tr>
<td></td>
<td>Electrical and Electronic Repairer</td>
</tr>
<tr>
<td></td>
<td>Marine Watercraft Repair and Maintenance Worker</td>
</tr>
<tr>
<td></td>
<td>Service Technician</td>
</tr>
<tr>
<td></td>
<td>Small Engine Mechanic</td>
</tr>
</tbody>
</table>