Tech Prep for Mechanical Related Program Areas

A consortium of High School, Community College and University Departments

This document contains student competency requirements for the specialized area of:

Introductory Mechanical Theory and Service Procedures

AMM 141
Up to 18 CREDITS (variable)

To receive college credit, a student must successfully complete all section competency requirements and attain a proficiency level of at least 80%. High school instructors are requested to initial each competency area that is completed by the student. By initialing these competencies, the instructor is verifying that the student has completed the required work at a level that merits college credit.

New October 2008

Note: Competency requirements may be modified as required to meet local conditions and training equipment; however the essential learning competency must be addressed.
## Introductory Mechanical Theory and Service Procedures

<table>
<thead>
<tr>
<th>COMPETENCY AREAS:</th>
<th>Credit Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit 1:</strong> Personal and Shop Safety</td>
<td>![ ]</td>
</tr>
<tr>
<td><strong>Unit 2:</strong> Basic Engine Theory</td>
<td>![ ]</td>
</tr>
<tr>
<td><strong>Unit 3:</strong> Basic Vehicle Servicing</td>
<td>![ ]</td>
</tr>
<tr>
<td>A: Basic Engine Service</td>
<td>![ ]</td>
</tr>
<tr>
<td>B: Automatic Transmission Service</td>
<td>![ ]</td>
</tr>
<tr>
<td>C: Manual Drive Train &amp; Axle Service</td>
<td>![ ]</td>
</tr>
<tr>
<td>D: Wheel &amp; Tire Diagnosis and Repair</td>
<td>![ ]</td>
</tr>
<tr>
<td><strong>Unit 4:</strong> Engine Performance</td>
<td>![ ]</td>
</tr>
</tbody>
</table>

**Student Name:** ____________________________________________________________

**High School:** ____________________________________________________________

**Student SS#:** ______________________ / SID # _______________________

____________________________________  ____________________________
(high school instructor signature)

Above signature verifies the identified student has successfully completed identified competencies at a proficiency level of 80% or greater and a local high school grade of A or B has been awarded.

**Date:** ______________________
Introductory Mechanical Theory & Service Procedures

Competency Rating Scale for Performance Tasks:

*Each of the competencies listed should be understood to represent basic to intermediate skills and abilities in the areas mentioned.*

4 - Highly Skilled/Proficient
   - Student can complete the competency accurately.
   - Student can direct others to do the competency.
   - Student needs little supervision.
   - Student knows the task completely.

3 – Skilled/Performs with Minimum Supervision
   - Student can perform all parts of the competency.
   - Student needs only completed work spot-checked.
   - A student meets speed and accuracy requirements (if any).
   - Student needs minimum supervision.
   - Student knows most of the task, but occasionally requires advice.

2 - Limited Skills/Performs with Close Supervision
   - Student can perform most parts of the competency.
   - Student needs help with only the most difficult parts.
   - Student needs close supervision.
   - Student knows some of the task but often requires advice/assistance.

1 – Exposure/Introductory
   - Student can do simple basics of this competency with very close supervision.
   - Student knows very limited scope of the task and requires assistance.

0 - No exposure/Not Taught
   - Student has had no exposure to this competency
### UNIT 3: Personal & Shop Safety

<table>
<thead>
<tr>
<th>Competency Rating Scale</th>
<th>Mastery Rating Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 3 2 1 0</td>
<td></td>
</tr>
</tbody>
</table>

3.1 The student shall demonstrate knowledge of general shop safety rules and procedures.

3.2 The student shall demonstrate safe procedures for care and use of mechanic related power tools and equipment i.e. grinders, drills and pneumatic tools.

3.3 The student shall demonstrate safe procedures for care and use of mechanic related hand tools.

3.4 The student shall demonstrate proper placement of floor jacks and jack stands for safe lifts of vehicles and/or equipment.

3.5 The student shall demonstrate knowledge of required lockout processes and procedures.

3.6 The student shall demonstrate knowledge of safe lifting and ladder use practices.

3.7 The student shall demonstrate knowledge of proper ventilation procedures and proper use of related masks and respirators.

3.8 The student shall demonstrate knowledge of safety marked areas, fire blankets, fire extinguishers use and placement, eyewash stations and evacuation routes.

3.9 The student shall comply with the use of safety glasses, gloves and/or shoes as required in the lab/shop.

3.10 The student shall demonstrate ability to locate and use material safety data sheets (MSDS).

3.11 The student shall demonstrate knowledge of measuring tools to include caliper, multimeter, micrometer, dial indicator, standard machinist ruler and tape measure.

3.12 The student shall demonstrate knowledge of safety factors involved in working with and/or charging batteries.

3.13 The student shall demonstrate knowledge of safety aspects of supplemental restraint systems (SRS) and antilock brake systems (ABS).

3.14 The student shall identify tools and their usage in automotive applications.

3.15 The student shall identify standard and metric designations.

3.16 The student shall demonstrate proper cleaning, storage and equip.
UNIT 1: Basic Engine Theory

1.1 The student shall demonstrate ability to properly identify four cycle engine components and describe function of given engine component.

1.2 The student shall demonstrate knowledge of differences between two and four cycle engines and identify effective uses of each.

1.3 The student shall demonstrate knowledge of differences between gas and diesel engines and identify effective uses of each.

1.4 The student shall demonstrate ability to correctly identify lubrication system components and describe the function of given components.

1.5 The student shall demonstrate ability to correctly identify ignition system components and describe the function of given components.

1.6 The student shall demonstrate ability to correctly identify cooling system components and describe the function of given components.

1.7 The student shall demonstrate ability to correctly identify fuel system components and describe the function of given components.

1.8 The student shall demonstrate ability to correctly identify exhaust system components and describe the function of given components.

1.9 The student shall demonstrate ability to correctly identify starting system components and describe the function of given components.

1.10 The student shall demonstrate ability to correctly identify charging system components and describe the function of given components.

1.11 The student shall demonstrate ability to effectively inspect engine component parts, identify wear and recommend corrective action.

1.12 The student shall demonstrate ability to identify manufacturer’s specifications / accepted wear tolerances.

1.13 The student shall demonstrate ability to accurately use the micrometer, caliper and plastigauge when evaluating engine component wear.

1.14 The student shall demonstrate ability to determine variances between part measurements and manufacturers specifications / tolerances.

1.15 The student will demonstrate ability to locate and use vehicle identification numbers and apply knowledge of VIN information.

1.16 The student will demonstrate ability to identify and use varied sources of service information.

Preparing a Vehicle for Service (to include work orders)
UNIT 2: Basic Vehicle Servicing

2.1 The student shall demonstrate correct and safe procedures of normal air filter service for air and/or oil bath filter systems.

2.2 The student shall demonstrate safe battery removal, cleaning and replacement procedures.

2.3 The student shall demonstrate safe procedures for using jumper cables to assist vehicle.

2.4 The student shall demonstrate proper battery testing procedures to include evaluation of specific gravity and load testing.

2.5 The student shall demonstrate ability to effectively clean and/or replace battery terminal cables.

2.6 The student shall properly check and adjust engine oil level to include performing oil and filter change.

2.7 The student shall properly check and adjust power steering fluid level.

2.8 The student shall properly check and adjust engine coolant level.

2.9 The student shall demonstrate ability to remove/replace radiator.

2.10 The student shall properly check and adjust brake fluid level.

2.11 The student shall properly check and adjust windshield washer fluid level.

2.12 The student shall properly check and adjust differential / transfer case fluid levels.

2.13 The student shall properly check and adjust transmission fluid level.

2.14 The student shall properly identify typical fluid types and uses.

2.15 The student shall demonstrate ability to inspect, replace and adjust drive belts, tensioners / pulleys and adjust for proper alignment and tension.

2.16 The student shall demonstrate ability to safely jack a vehicle and remove / replace the wheel.

2.17 The student shall demonstrate ability to inspect for fuel, oil, coolant and other leaks and determine appropriate corrective action.

2.18 The student shall demonstrate ability to inspect and change powertrain mounts.

2.19 The student shall demonstrate ability to diagnose tire wear patterns.
2.20 The student shall demonstrate knowledge of tire rotation and diagnosis.

2.21 The student shall demonstrate ability to complete tire repair and proper remount on vehicle.

2.22 The student shall demonstrate ability to balance a wheel both statically and dynamically.

2.23 The student will properly dismount, inspect, repair and replace wheel.

### UNIT 5: Engine Performance

<table>
<thead>
<tr>
<th>Competency Rating Scale</th>
<th>Mastered for college credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 3 2 1 0</td>
</tr>
</tbody>
</table>

5.1 The student shall demonstrate ability to identify and visually inspect A/C system components.

5.2 The student shall ability to locate refrigerant label and identify specified refrigerant type (e.g. R-12, R134a)

5.3 The student shall demonstrate ability to diagnose engine starting and/or operation problems

5.4 The student shall demonstrate ability to perform absolute manifold pressure test and determine appropriate action.

5.5 The student shall demonstrate ability to perform cylinder balance test and determine appropriate action.

5.6 The student shall demonstrate ability to check for fuel contaminants and determine necessary action.

5.7 The student shall demonstrate ability replace fuel filter.

5.8 The student shall demonstrate ability to inspect and text cold enrichment system and components and perform required corrective actions.

5.9 The student shall demonstrate ability to obtain and interpret scan tool data.

5.10 The student shall demonstrate ability to identify and interpret suspension and steering concerns and determine appropriate actions

5.11 The student shall demonstrate ability to inspect and test fuel injectors.

5.12 The student shall demonstrate ability to check and adjust idle speed.

5.13 The student shall demonstrate ability to inspect throttle body, air induction, intake manifold and gaskets for vacuum leaks and/or unmetered air.

5.14 The student shall demonstrate ability to fill and bleed hydraulic brake system.
Competency Verification Process

Students submit instructor verification of student competency attainment in each of the six identified sections.