WEBSTER GROVES SCHOOL DISTRICT
BOARD OF EDUCATION ITEM OF CONSIDERATION

DATE: April 13, 2015

TOPIC/PROPOSAL:
Approval of 7-12 Industrial Technology Curriculum

BACKGROUND INFORMATION:
Over the past year and a half, numerous staff members have worked to develop a written curriculum that aligns with the most current educational standards for music and the Marzano Teacher Evaluation Model adopted by the district. In addition and most important, teachers and leadership placed an emphasis on developing curriculum that is rigorous and relevant for students.

The 7-12 Industrial Technology curriculum is attached.

INSTRUCTIONAL IMPACT/RATIONALE:
The revised 7-12 curriculum will better enable our students to apply their skills and knowledge of industrial technology to design and solve "real world" problems.

CSIP/DISTRICT GOAL ADDRESSED:
* WGSD will personalize learning for all students to increase engagement and rigor resulting in improved student achievement.
*WGSD will make a positive impact on the world by being a model for teaching, learning and practicing sustainability.

FISCAL NOTE:
No increase in FTE.

ADMINISTRATIVE RECOMMENDATION:
- **Action Requested: _X__**
- **Information: ____**
- **Proposed Motion for Approval (if applicable):**

I move that the Board of Education adopt the 7-12 Industrial Technology curriculum for the 2014-15 school year.

PREPARED BY: John Simpson

Motion: _____ **Second: _____**

Board Vote: ___(yes) ___(no) ___(abstain) ___(Consent Agenda)

Standards: The industrial technology curricula was aligned to the latest version of standards within each content including Standards for Technological Literacy, Missouri Learning Standards, and the Next Generation Science Standards.

Rationale: It is critical for students today to engage in learning that is relevant, rigorous, and rewarding. In addition to engaging in learning that is cognitively demanding and challenging, students need to be able to apply their knowledge and skills across contents and contexts within the school environment, and more importantly in the "real world." For it is when this application extends outside the boundaries of the school, that interest, relevance, and value are maximized.

While the curriculum is designed to support the transference of knowledge and skills, district staff working together must learn and work to provide authentic and engaging learning opportunities for students. As they engage in such learning within the Industrial Technology curricula, a priority will be placed on ensuring students are given learning opportunities that challenge them to use technical, technological, problem-solving, and collaborative skills in order to solve real-world problems.

Course Changes: Renewable Energies was the only new course added at this time. The course was written to provide students with the opportunity to engage in relevant learning in the area of sustainability including how to apply their learning personally and professionally.

Items of note: The following is an item of note regarding the industrial technology curricula:

- The curricula for Introduction to Robotics and Advanced Robotics were added to Industrial Technology since the last time the entire curriculum was written.

Webster Groves School District Est. 1868

7-12 Industrial Technology Curriculum

Presented to the Board of Education on
Monday, April 13, 2015

As a learning community, the Webster Groves School District will lead in purposeful innovation that challenges each of us to discover and pursue our passions and make a positive impact on the world.

Table of Contents

Rationale for Curriculum

It is critical for students today to engage in learning that is relevant, rigorous, and rewarding. In addition to engaging in learning that is cognitively demanding and challenging, students need to be able to apply their knowledge and skills across contents and contexts within the school environment, and more importantly in the "real world." For it is when this application extends outside the boundaries of the school, that interest, relevance, and value are maximized.

While the curriculum is designed to support the transference of knowledge and skills, district staff working together must learn and work to provide authentic and engaging learning opportunities for students. As they engage in such learning within the Industrial Technology curricula, a priority will be placed on ensuring students are given learning opportunities that challenge them to use technical, technological, problem-solving, and collaborative skills in order to solve real-world problems.

Process of Curriculum Review Leading to Board Approval

Review Checklist for Draft Phase One (curriculum coordinator and/or high school designee):

- The curriculum which includes learning goals and proficiency scales is written using the district template.
- Learning goals are priority, transferable understandings and skills relevant for students within and across disciplines and situations.
- Cultural relevance is evident in the learning goals and/or proficiency scales when applicable (in curriculum, always applicable in design of learning).
- Approximately 8-11 learning goals are created per semester per course or content. *There may be a good reason for more or less.*
- Learning goals are aligned to "governing" curriculum standards.
- Approximately 2-4 sample learning targets are included for each learning goal (optional).
- Proficiency scales clearly articulate a progression of learning with the learning goals and can be understood by students, staff, and families.
- On the proficiency scale:
  Level 4: Includes the statement, "Student demonstrates an in-depth inference or advanced application, or innovates with the learning goal."(Examples may be included).

  Level 3: Student demonstrates mastery with the learning goal as evidenced by…(**GRADE LEVEL/COURSE CURRICULUM EXPECTATION**)

  Level 2: Student demonstrates he/she is nearing the learning goal by…and includes identification of the "discipline- specific vocabulary" directly tied to the learning goal.
  Level 1: Student demonstrates a limited understanding or skill with the learning goal by…

- The curriculum is well-written and in the present tense.
- The content, vocabulary, and language are aligned across grade levels and/or courses (if applicable and by curriculum coordinator).

Review Checklist for Draft Two (Reviewers: Gabrielle Corley or John Simpson)

- The curriculum is written in a manner consistent with district expectations. The "style sheet" will be used to provide feedback.
- The curriculum is written with appropriate conventions and tense. The content and language are aligned across grade levels and/or courses. While the reviewers will examine the vertical progression of the curriculum, they will rely heavily on those developing the curriculum.

Review Checklist for Final Draft (John Simpson)

- If the curriculum is written in a manner consistent with district expectations, it's taken before the CCC for feedback and then the board of education for approval.
- The curriculum is put into digital form following board approval.

WGSD Curriculum
Industrial Technology Department

Course: Industrial Technology
Grade Level: 7 - 8
LG 1 Woodworking

High Priority Standards

Missouri Carpentry Instructional Framework
Introductory Craft Skills
Module 00103-09 – Introduction to Hand Tools

1. Recognize and identify some of the basic hand tools and their proper uses in the construction trade.
2. Visually inspect hand tools to determine if they are safe to use.
3. Safely use hand tools.

Module 00104-09 – Introduction to Power Tools

1. Identify power tools commonly used in the construction trades.
2. Use power tools safely.
3. Explain how to maintain power tools properly.

Learning Goal	Proficiency Scale
Students will be able to make a finished wood product from raw materials.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Utilizing designated machinery and tools to cut and shape wood. • Applying gluing, shaping, and polishing techniques. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: tape measure, rule, try-

	square, pencil, paper, handsaw, cross cut, rip cut, band saw, scroll saw, disk/belt sander, BOSS sander, palm sander, sanding block, drill press, twist bit, spur bit, speed bit, center punch, nail set, claw hammer, mallet, abrasive paper, glue, clamps, screwdriver, stain, clear finish, paint brush, wax paste, steel wool. • Performing processes such as: o Identifying a project to be completed. o Measuring material length, width, and thickness with accuracy using English Standard Measurement (inches). o Locating the different parts of a board. (End, Edge, and Face) o Cross-cutting material to rough length. o Preparing wood surfaces for staining/finishing by using proper abrasives. (60-grit, 80-grit, etc.) o Choosing equipment for appropriate tasks in order to complete projects. o Applying stain and/or finish to project. o Assembling project for completion Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Industrial Technology
Grade Level: 7 - 8
LG 2 Metal Working

<table>
<tr><td colspan="2">High Priority Standards

Missouri HVAC Instructional Framework
Introductory Craft Skills
Module 03213-07 – Sheet Metal Duct Systems
1. Identify and describe the basic types of sheet metal.
2. Describe a basic layout method and perform proper cutting.
3. Join sheet metal duct sections using proper seams and connectors.</td></tr>
<tr><td>Learning Goal

Student will be able to create a metal product from raw materials.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Utilizing designated machinery and tools to cut and shape metal.
• Applying gluing, shaping, and polishing techniques.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: Sheet Metal, try-square, ruler, tape measure, hems, folds, tabs, pencil, sharpie, scratch awl, tin snips, vise grips, spot welder, flat metal file, emery cloth, spray paint, box and pan break, squaring shear.
• Performing processes such as:
o Cutting material to length and width using the Squaring Shear</td></tr>
</table>

	○ Laying-out hems, tabs, and holds using appropriate tools in the lab. ○ Cutting project to final size using Tin Snips. ○ Folding Hems, Folds, and Tabs in proper sequence using the Box and Pan Break. ○ Using Appropriate hand tools to assist with bending process of project. ○ Using Spot Welder to fuse their project together. ○ Preparing surface for completion/painting using appropriate methods. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Industrial Technology
Grade Level: 7 - 8
LG 3 Plastics

High Priority Standards

Missouri Carpentry Instructional Framework
Introductory Craft Skills
Module 00103-09 – Introduction to Hand Tools

1. Recognize and identify some of the basic hand tools and their proper uses in the construction trade.
2. Visually inspect hand tools to determine if they are safe to use.
3. Safely use hand tools.

Module 27102-06 – Building Materials, Fasteners, and Adhesives
8. Describe the fasteners, anchors, and adhesives used in construction work and explain their uses.

Learning Goal	**Proficiency Scale**
Students will be able to create a plastics product from raw materials.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. **Level 3**: Student demonstrates mastery with the learning goal as evidenced by: • Utilizing designated machinery and tools to cut and shape plastic. • Applying gluing, shaping, and polishing techniques. **Level 2**: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: Transparent Acrylic Plastic, Translucent Acrylic Plastic, scroll saw, band saw, disk/belt sander, abrasive paper, flat file, half-round file, round file, square file, triangle file, file card & brush, vise, buffer, drill press, twist bit, bullet effect, c-clamp

	• Performing processes such as:
	  o Choosing a color scheme for a project.
	  o Identifying types of plastics.
	  o Identifying a project to be completed.
	  o Identifying specific parts of machinery in order to perform simple maintenance and troubleshooting.
	  o Following a plan sheet for assembly.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Industrial Technology
Grade Level: 7 - 8
LG 4 Drafting

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">Missouri Carpentry Instructional Framework
Introductory Craft Skills
Module 00105-09 – Introduction to Construction Drawings
1. Recognize and identify basic construction drawing terms, components, and symbols.
4. Interpret and use drawing dimensions.</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will be able to create and interpret working drawings.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Constructing a reproducible drawing using perspective.
• Interpreting an orthographic projection used with a project.

Level 2: Student demonstrates he/she is nearing proficiency by:
Recognizing and recalling specific vocabulary, such as: Pencil, eraser, ruler, isometric view, orthographic view, border line, object line, visible line, leader lines, center line, hidden line, graph paper, lettering, top, right, front, back, left, and bottom.
• Performing processes such as:
o Identifying differences between Isometric and Orthographic views.
o Sketching multi-view drawings.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify the difference between Isometric and Orthographic views
- Identify 6 different perspectives of an object (top, bottom, left, right, front, back)
- Draw various lines used in drafting.
- Draw letters/numbers in Block style.
- Draw Orthographic view (top, front, right side) when given an isometric view.
- Draw Isometric view (multi-perspective drawing) when given the orthographic views (8^{th} grade)

WGSD Curriculum
Industrial Technology Department

Course: Industrial Technology
Grade Level: 7 - 8
LG 5 Measurement

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">Missouri Carpentry Instructional Framework
Introductory Craft Skills
Module 00102-09 – Introduction to Construction Math
1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.
2. Use a standard ruler, a metric ruler, and a measuring tape to measure.
3. Add, subtract, multiply, and divide fractions.</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will be able to attend to precision when measuring.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Applying measurements, such as sixteenths, eighths, fourths, halves, and whole inches, to a project.
• Reducing fractions to their lowest terms.
• Measuring objects in various graduations of an inch.

Level 2: Student demonstrates he/she is nearing proficiency by:
Recognizing and recalling specific vocabulary, such as: Ruler, Pencil/Pen, paper, reduce fractions, denominator, numerator, fraction, whole number, mixed number, and improper fractions.
• Performing processes such as:
o Identifying measurement increments on a ruler.</td></tr>
</table>

	○ Reading a ruler with accuracy. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Measure objects in various graduations of an inch, with the furthest graduation being sixteenths.
- Reduce fractions into lowest terms.
- Write measurements in mixed number form.
- Use 3-steps in reading a ruler.

WGSD Curriculum
Industrial Technology Department

Course: Industrial Technology
Grade Level: 7 - 8
LG 6 Safety

<table>
<tr><td colspan="2">High Priority Standards

Missouri Carpentry Instructional Framework
Introductory Craft Skills
Module 00101-09 – Basic Safety

1. Explain the idea of a safety culture and its importance in the construction crafts.
2. Identify causes of accidents and the impact of accident costs.
7. Identify struck-by hazards and demonstrate safe working procedures and requirements.
8. Identify caught-in-between hazards and demonstrate safe working procedures and requirements.</td></tr>
<tr><td>Learning Goal

Students will be able to operate safely in a shop environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Applying safety margins for all equipment, such as closeness of fingers to equipment and holding stock at the right angle.
• Using the correct machinery for the material in hand.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: Band Saw, Scroll Saw, Drill Press, Disc/Belt Sander, BOSS Sander, Jointer, Surfacer, Router Table, Hand Tools, Hand-held Power Tools, Turn-on Procedure, Turn-off Procedure, safety precautions, blades, abrasive paper, chuck key, push stick, spur bit, spade</td></tr>
</table>

	bit, twist bit, center punch, nail set, pencil, ruler, other hand tools, etc.
	• Performing processes such as:
	  ○ Identifying different parts on machinery.
	  ○ Identifying hand tools and miscellaneous equipment.
	  ○ Identifying different parts on machinery.
	  ○ Turning machines on and off in the correct sequence.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Turn on/Turn off machines in proper sequence
- Hold stock on work surfaces (machine tables) in a safe matter
- Pass Safety final with a 70% or better.
- Identify different parts on machinery
- Replace blades/abrasive papers on appropriate machines.
- Use proper materials on machines (wood to be used on wood working machines, same with plastics and metalworking.)
- Know safety margin for all equipment (closest fingers can get to moving parts)
- Identify different hand tools, drill bits, and other miscellaneous equipment used in the Industrial Technology Lab.

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 1 Safety

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
1. Drafting Room Procedures - Safety
1.1 Apply safety policies and procedures.
1.3 Identify American National Standards Institute, Inc. (ANSI) and International Standards Organization retrieval).
1.6 Identify and apply ergonomic considerations.</td></tr>
<tr><td>Learning Goal

Students will be able to keep themselves safe in a working shop environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Exhibiting ergonomic and personal safety awareness while working.
• Adapting the physical environment for personal work needs.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: First aid, health hazard, safety hazard, chemical substance, biological agent, physical agent, ergonomics, disinfectant, risk.
• Performing processes such as:
○ Identifying elements that could lead to injury to self or others in shop</td></tr>
</table>

	work areas. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Describe and demonstrate correct ergonomics.
- Consider physical environment (e.g., keyboard position, screen position, lighting).
- Identify and demonstrate personal safety and awareness of safety for others (e.g., electrical and mechanical hazards).

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 2 Tools and Equipment

High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
2.1 Hardware
- 2.1.1. Demonstrate proper care of equipment
- 2.1.2 Demonstrate proper use, care, and adjustment of drawing instruments and equipment and computer equipment.
- 2.1.4 Operate and adjust input devices (e.g., mouse, keyboard, digitizer, scanner).
- 2.1.5 Operate and adjust output devices (e.g., printers, plotters, data transfer).
- 2.1.6 Identify and use data storage, retrieval and backup systems.
- 2.1.7 Identify operating systems and procedures.

NETs-S/TILs
Tools of the Trade
Utilize a working knowledge of technology or technological support services to identify a problem/issue and its solution.

Learning Goal	Proficiency Scale
Students will be able to use and maintain computer technology used in technical fields.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Operating all input, output, and storage devices independently. • Calibrating and adjusting monitors for personal use.

	• Caring for equipment and software to preserve operability of the tools. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: hardware, keyboard, mouse, scanner, output, server, CPU, monitor, flash drive, USB cable, pad, printer, plotter. • Performing processes such as: o Identifying input, output and storage options. o Following class procedures to operate software and equipment . Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Demonstrate proper care of equipment.
- Operate and adjust input devices (e.g., mouse, keyboard, digitizer).
- Operate and adjust output devices (e.g., printers, plotters, modems).
- Handle storage media, retrieval, and backup.
- Adjust monitor controls for maximum comfort and usability.

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 3 Drafting

High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
3. Basic Drawing Skills
- 3.1 Lay out drawing.
- 3.2 Construct borders and information blocks.
- 3.3 Construct freehand sketches.
- 3.4 Read and transfer measurements (English and metric).
- 3.5 Letter freehand (letters and numerals).
- 3.6 Demonstrate techniques in line construction (e.g., weights, types and uniformity).
- 3.7 Construct a reproducible drawing with mechanical pencils.
- 3.9 Perform basic geometric construction (e.g., line dividing, angles, tangents, polygons, arcs).

Missouri Learning Standards
MATH-HSG-MG.A.3 Apply geometric methods to solve design problems. (Drawing an industry standard plan)

Learning Goal	**Proficiency Scale**
Students will be able to communicate with a drawing.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Using drawing media with correct form and choice of tools for the task. • Using all standard measurement tools with precision.

	• Applying all line style and weights, symbols, annotations and copy methods.
	• Producing an industry standard plan that someone else could use to build an item.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: t-square, triangle, c-size paper, drafting vellum, protractor, french curve, engineering scale, architect scale, metric scale, blueprint, line.
	• Performing processes such as:
	  ○ Identifying drawing media and standard measurements.
	  ○ Identifying all styles, symbols, annotations and copy methods.
	  ○ Drawing a basic plan.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Use drawing media and related drafting materials (e.g., papers, vellum, Mylar, plotter pens, toner cartridges).
- Use basic measurement systems (e.g., fractions, decimals, and metric measurements).
- Add correct annotation to drawing.
- Identify line styles and weights.
- Prepare title blocks and other drafting formats.
- Apply metric and/or dual dimensioning drawing standards.
- Identify and use appropriate standard symbols.
- Reproduction of originals using different methods (e.g., photocopy, plot, blueprint).
- Create freehand technical sketches.

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 4 Orthographic and Auxiliary Views

High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting

4. Orthographic Projections: Multi-views
    - 4.1 Identify use and application of orthographic drawings (3rd angle).
    - 4.2 Identify 1st and 3rd angle projection drawings.
    - 4.3 Interpret an orthographic projection (3rd angle).
    - 4.4 Sketch multi-view drawings (3rd angle).
    - 4.5 Prepare orthographic drawings (3rd angle).
5. Auxiliary Views
    - 5.1 Identify use and application of auxiliary views.
    - 5.2 Construct primary auxiliary views

Missouri Learning Standards
Math-HSG-CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

Learning Goal	Proficiency Scale
Students will understand how to illustrate a 3-dimensional object using multiple 2-dimensional views.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Creating multi-view drawings that include orthographic, auxiliary, and section

<table>
<tr><td></td><td>views.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: views, orthographic projections, 3 dimensional, solid, height, length, width/depth, face, plane, parallel, profile.
• Performing processes such as:
o Identifying orthographic, auxiliary, and section views.
o Completing multi-view sketches.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
<tr><td colspan="2">Learning Targets

Students know how to:
● Identify, create, and place appropriate orthographic views.
● Identify, create, and place appropriate auxiliary views.
● Identify, create, and place appropriate section views.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 5 Pictorial Drawing

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
8. Pictorial Drawings
8.1 Identify use and application of pictorial drawings.
8.2 Sketch pictorial drawings.
8.3 Construct axonometric, oblique, and perspective drawings.</td></tr>
<tr><td>Learning Goal

Students will be able to use a two-dimensional drawing to illustrate 3 dimensions.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Creating full pictorial drawings that include axonometric, oblique and perspective view.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: horizon line, 3 point perspective, true length, vanishing point, axes, ground line, axonometric projection, isometric, oblique, cabinet style.
• Performing processes such as:
o Identifying axonometric, oblique, and perspective drawings.
o Completing pictorial sketches.</td></tr>
</table>

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify and create axonometric drawings (e.g., isometric, dimetric, trimetric).
- Identify and create oblique drawings (e.g., cabinet, cavalier).
- Identify perspective drawings (e.g., 1-point, 2-point, 3-point).

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 6 Dimensioning and Tolerancing

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
9. Dimensioning and Tolerancing as Applied to Specific Drafting Fields.
9.1 Construct the lines used to dimension drawings.
9.2 Identify and apply dimensioning practices.
9.3 Identify and apply tolerancing.
9.5 Dimension drawing using ANSI and ISO Standards.

Missouri Learning Standards
<u>Math</u><u>-GMD.A.3</u> Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems (Visualize relationships between two-dimensional and three-dimensional objects).</td></tr>
<tr><td>Learning Goal

The student will be able to communicate a dimensional concept with a drawing.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Illustrating concepts (such as size, material, finishes, location, shape) of two and three-dimensional objects.
• Creating dimensional drawings that meet accepted industry standards for drafting.

Level 2: Student demonstrates he/she is nearing proficiency by:</td></tr>
</table>

	• Recognizing and recalling specific vocabulary, such as: aligned system, arrowhead, center line, coordinates, cutting-plane line, dimension line, height, leader, schedule, specifications, tolerance, unidirectional system.
	• Performing processes such as:
	  o Describing correct form and use of drawing tools.
	  o Completing required drawings.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Apply dimensioning rules correctly (e.g., avoid redundant dimensioning, avoid dimensioning to hidden lines).
- Use correct dimension line terminators (e.g., arrowheads, ticks, slashes).
- Dimension objects (e.g., lines, arcs, angles, circular).
- Dimension complex shapes (e.g., spheres, cylinders, tapers, pyramids).
- Dimension features from a center line.
- Dimension a theoretical point of intersection.
- Use appropriate dual dimensioning standards.
- Use size and location dimension practices.
- Use various dimensioning styles (e.g., Cartesian, polar, ordnance, datum).
- Place tolerance dimensioning and Geometric Dimensioning and Tolerancing (GD&T) on drawings when appropriate.

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 7 Drafting in CAD

High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
11. Basic CAD Skills
- 11.1 Create new 2-D drawings.
- 11.2 Perform drawing setup to applicable standards (e.g., settings, layers, line types and widths).
- 11.3 Identify and use view and display commands (e.g., settings, layers, line types and widths).
- 11.4 Use query commands to extract drawing data (e.g., entity characteristics, distance, area, status).
- 11.5 Edit, copy, and manipulate drawing entities (e.g., entity characteristics, distance, area, status).
- 11.6 Save, retrieve and manage drawings.
- 11.7 Dimension drawings.
- 11.8 Set and change dimensioning variables.
- 11.12 Create, edit and retrieve component/symbol libraries (e.g., groups, blocks, symbols, third-party libraries).
- 11.13 Identify and apply layering techniques.
- 11.14 Identify methods of sharing drawings (e.g., team projects).

NETS/TILS
Create and Communicate
Employ curriculum-specific, technology-based simulations to aid in understanding complex, real-world systems. Simulation studies include formulating problems, developing models, running models, and analyzing outputs that help predict behaviors and outcomes. (Communicating with drawings)

WGSD Curriculum
Industrial Technology Department

Learning Goal	**Proficiency Scale**

Student will be able to use digital tools to communicate with drawings.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	• Setting up and using CAD software environment and tools.
	• Using software-based measurement tools with precision.
	• Using the CAD environment to create, edit and manipulate drawings that meet industry standards.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: (in addition to dimensional drawing terms): CAD, monitor, mouse, format, render, layer, control point, preset, parametric, data CAD, auto CAD, google sketch-up.
	• Performing processes such as:
	  ○ Identifying and using all styles, symbols, annotations, and file management tools.
	  ○ Constructing geometric figures and wireframe/solid models.
	  ○ Using text features in the software.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

Students know how to:

- Create new drawing.
- Perform drawing set up.
- Construct geometric figures (e.g., lines, splines, circles, and arcs).
- Create text using appropriate style and size to annotate drawings.
- Use and control accuracy enhancement tools (e.g. Entity positioning methods such as snap and XYZ).
- Identify, create, store, and use appropriate symbols/libraries.
- Create wireframe/solid models.
- Create objects using primitives.
- Create 2-D geometry from 3-D models.
- Revolve a profile to create a 3-D object.
- Create 3-D wireframe models from 2-D geometry.

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 8 Orthographic and Auxiliary Views in CAD

High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting

4. Orthographic Projections: Multi-views
    - 4.1 Identify use and application of orthographic drawings (3rd angle).
    - 4.2 Identify 1st and 3rd angle projection drawings.
    - 4.3 Interpret an orthographic projection (3rd angle).
    - 4.4 Sketch multi-view drawings (3rd angle).
    - 4.5 Prepare orthographic drawings (3rd angle).
5. Auxiliary Views
    - 5.1 Identify use and application of auxiliary views.
    - 5.2 Construct primary auxiliary views
12. Advanced CAD Skills
    - 12.5 Create 2-D geometry using 3-D models.

Missouri Learning Standards

Math-HSG-CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

WGSD Curriculum
Industrial Technology Department

Learning Goal	**Proficiency Scale**
Students will understand how to illustrate a 3-dimensional object using multiple 2-dimensional views in the CAD environment.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Creating multi-view drawings that include orthographic, auxiliary, and section views in the CAD environment. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: views, orthographic projections, 3 dimensional, solid, height, length, width/depth, face, plane, parallel, profile. • Performing processes such as: o Identifying orthographic, auxiliary, and section views in the CAD environment. o Completing multi-view sketches in the CAD environment. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

Students know how to:

- Create, and place appropriate orthographic views.
- Create, and place appropriate auxiliary views.
- Create, and place appropriate section views.

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 9 Pictorial Drawing in CAD

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Industrial Technology
MoDese Performance Indicators for Drafting
8. Pictorial Drawings.
8.1 Identify use and application of pictorial drawings.
8.2 Sketch pictorial drawings.
8.3 Construct axonometric, oblique, and perspective drawings.
11. Basic CAD Skills.
11. Create new 2-D drawings.</td></tr>
<tr><td>Learning Goal

Students will be able to use a two-dimensional drawing to illustrate 3 dimensions in the CAD environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Interpreting and producing axonometric, oblique, and perspective drawings using CAD software.
• Creating full pictorial drawings that meet accepted industry standards using CAD software.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: : horizon line, 3 point perspective, true length, vanishing point, axes, ground line, axonometric projection, isometric, oblique, cabinet style, CAD.</td></tr>
</table>

	• Performing processes such as:
	  ○ Identifying axonometric, oblique, and perspective drawings.
	  ○ Completing pictorial sketches using software.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Create axonometric drawings in CAD (e.g., isometric, diametric, trimetric).
- Create oblique drawings in CAD (e.g., cabinet, cavalier).
- Create perspective drawings in CAD (e.g., 1-point, 2-point, 3-point).

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 10-12
LG 10 Dimensioning and Tolerancing in CAD

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
9. Dimensioning and Tolerancing as Applied to Specific Drafting Fields
9.1 Construct the lines used to dimension drawings.
9.2 Identify and apply dimensioning practices.
9.3 Identify and apply tolerancing.
9.4 Identify and apply geometric dimensioning and tolerancing techniques.
9.5 Dimension drawing using ANSI and ISO Standards.
12. Advanced CAD Skills
12.4 Edit solids, curves, and surfaces.</td></tr>
<tr><td>Learning Goal

The student will be able to communicate a dimensional concept with a drawing in the CAD environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Illustrating concepts (such as size, material, finishes, location, shape) of two and three-dimensional objects in the CAD environment.
• Creating dimensional drawings that meet accepted industry standards for drafting.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: (in addition to</td></tr>
</table>

	dimensional drawing terms) entity, arc, cone, dome, contour, surface meshes, units, relative co-ordinates, polar co-ordinates, world co-ordinate system, user co-ordinate system.
	• Performing processes such as:
	  ○ Identifying and describing dimension objects such as lines, arcs, and angles.
	  ○ Identifying and describing complex shapes such as spheres and cylinders.
	  ○ Using different dimensioning styles such as polar and ordinate.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Apply dimensioning rules correctly (e.g., avoid redundant dimensioning, avoid dimensioning to hidden lines).
- Use correct dimension line terminators (e.g., arrowheads, ticks, slashes).
- Dimension objects (e.g., lines, arcs, angles, circular).
- Dimension complex shapes (e.g., spheres, cylinders, tapers, pyramids).
- Dimension features from a center line.
- Dimension a theoretical point of intersection.
- Use appropriate dual dimensioning standards.
- Use size and location dimension practices.
- Use various dimensioning styles (e.g., Cartesian, polar, ordinate, datum).
- Place tolerance dimensioning and Geometric Dimensioning and Tolerancing (GD&T) on drawings.
- Use associative dimensioning correctly when appropriate.

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting
Grade Level: 9-12
LG 11 Career Skills

High Priority Standards

MoDese Performance Indicators for Industrial Technology
Drafting
21. Leadership competencies
21.2 Demonstrate and understanding of one's personal values**.**
21.4 Demonstrate interpersonal skills.
21.5 Demonstrate etiquette and courtesy.
21.6 Demonstrate effectiveness in oral and written communication.
21.7 Develop and maintain a code of ethics.
21.8 Maintain a professional appearance.

Missouri Learning Standards
ELA-Literacy in Science and Technical subjects: RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. (Researching careers and comparing/contrasting with learned skills)

Learning Goal	Proficiency Scale
Students will understand the importance of planning for a future career in drafting.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Describing the relationship between skills learned in class and future employment in related fields. • Creating a career plan based on interest and ability.

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: engineer, architect, draftsman, project manager, employment trend, educational terms (associate degree, bachelor's degree, master's degree, specialized technical training, credit hours).
	• Performing processes such as:
	  ○ Comparing drafting career options.
	  ○ Identifying personal and interpersonal traits that create success in any field of work.
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Research what collegiate programs are available locally, nationally, and globally.
- Explore what is needed to continue in this field.
- Analyze job market trends locally, nationally, and globally.
- Research what technical training is available locally, nationally, and globally.
- Explore available internships locally, nationally, and globally.

WGSD Curriculum
Industrial Technology Department

Course: Advanced Class- Architectural Drafting and CAD
Grade Level: 10-12
LG 12 Independent Project

High Priority Standards

International Technology Education Association **http://www.iteaconnect.org/TAA/PDsF/xstnd.pdf**
Standards for Technological Literacy : Understanding of Design
Standard 8. Students will develop an understanding of the attributes of design.
Standard 9. Students will develop an understanding of engineering design.
Standard 10. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Standards for Technological Literacy : Abilities for a Technological World
Standard 11. Students will develop abilities to apply the design process.

Learning Goal	**Proficiency Scale**
Students will be able to apply architectural drafting concepts and skills to a self-selected design problem.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Developing an engineering problem and creating a design to solve it. • Creating a solution to a design problem. • Applying the attributes of design and skills of engineering to solve a problem. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: elevation, sketch, plot plan, profile view, plan view, model, presentation, masters parameters, materials, structure. • Performing processes such as: ○ Creating a solution to a design problem.

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Brainstorm and record solutions.
- Share, discuss and choose the best solution.
- Complete development work.
- Build a prototype.
- Test and redesign.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Electronics
Grade Level: 9 - 12
LG 1 Safety

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MO Dese Standards for Industrial Technology
Electronics
A. Appreciate and apply all personal and workplace safety procedures.

Missouri Learning Standards
ELA
Reading in Science and Technical areas 11-12.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (First aid manuals, electrical code manuals)</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Student will be able to apply personal and workplace safety procedures in electrical construction environments.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the purpose of OSHA and how it promotes safety on the job.
• Demonstrating appropriate workplace safety practices, such as those involving electrical, hand-tool, power-tool, lockout/tagout, and environmental hazards.
• Demonstrating safe and proper use of AC line operation.
• Performing a hazard assessment of a job before attempting it.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: A, B, C, D fire</td></tr>
</table>

	extinguishers (types), treatment for shock, treatment for internal burns, resuscitation, AC power, lockout/tagout designations, grounding, testing, GFCI.
	• Performing processes such as:
	  ○ Identifying types, purposes and operations of fire extinguishers.
	  ○ Recognizing when first aid is needed in electrical situations.
	  ○ Identifying electrical hazards.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify types, purposes and operations of fire extinguishers.
- Recognize when first aid is needed.
- Identify electrical hazards.
- Demonstrate appropriate workplace safety practices (ie; electrical, hand-tool, power-tool, lockout/tagout, and environmental hazards).
- Demonstrate safe and proper use of AC line operation equipment (grounding, testing, gfci).

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Electronics
Grade Level: 9 - 12
LG 2 Circuits and Electrical Theory

High Priority Standards

MoDese Performance Indicators for Electronics
Electronics
B. Test fundamental electronic circuits and devices in accordance with Industry and Safety Standards.
K. Construct circuits consistent with industry and safety standards.

Missouri Learning Standards
Math
Algebra –Creating Equations D.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R*

Learning Goal	Proficiency Scale
Students will understand how electronic devices function.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: ● Evaluating and testing sources of DC and AC signals and power. ● Explaining and applying Ohm's law. ● Evaluating and testing DC circuits (e.g. parallel, series and series-parallel). ● Evaluating and testing basic circuit controls, such as switches, fuses, and circuit breakers. ● Describing and explaining the purpose of electrical components, such as capacitors, transformers, inductors, and resistive devices. ● Calculating the relationship between volts, watts, and amps (Volts/watts=amps).

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: DC, AC, meters, resistance, capacitance, voltage, watts, amps, power, series, parallel, fuses, switches: PBNO, PBNC, SPST, SPDT.
	• Performing processes such as:
	  ○ Identifying the meters used to measure voltage, current, and resistance.
	  ○ Describing the difference between conductors and insulators.
	  ○ Identifying the characteristics of series and parallel circuits.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Evaluate and test sources of DC and AC signals and power.
- Explain and apply Ohm's law.
- Evaluate and test DC circuits (e.g. parallel, series and series-parallel).
- Evaluate and test capacitors.
- Evaluate and test transformers.
- Evaluate and test inductors.
- Evaluate and test resistive devices.
- Evaluate and test basic circuit controls (e.g. switches, fuses, and circuit breakers).
- Calculate the relationship between volts, watts, and amps (Volts/watts=amps).

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Electronics
Grade Level: 9 - 12
LG 3 Schematics

High Priority Standards

MO Dese Standards for Industrial Technology
Drafting
15. Introduction to Residential and Commercial Wiring Drawings
- 15.1 Identify electrical symbols
- 15.2 Identify applicable codes (e.g., IEC, NEC and IEEE)
- 15.3 Produce wiring schematics

16. Introduction to Electronic Drawings
- 16.1 Identify electronic symbols
- 16.2 Produce electronic/electrical schematics and diagrams

Missouri Learning Standards
ELA - Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. (Reading and applying schematics)

Learning Goal	**Proficiency Scale**
Students will be able to read and produce a schematic drawing.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Interpreting a typical layout of a residential room. • Interpreting a pictorial diagram. • Producing an original drawing using components such as, schematic symbols, and layouts with accurate dimensions.

	• Illustrating how major electrical systems relate to each other using a block diagram.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: Schematic drawing, block diagram, pictorial diagram, wiring diagram, elementary line diagram.
	• Performing processes such as:
	  ○ Identifying sixty plus schematic symbols.
	  ○ Identifying similarities and difference between common schematic symbols
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify sixty plus schematic symbols.
- Draw forty plus schematic symbols.
- Identify similarities and difference between common schematic symbols.
- Interpret a typical layout of a residential room.
- Draw a typical layout of a residential room.
- Use accurate dimensions in drawing a layout.
- Illustrate how major electrical systems relate to each other using a block diagram.
- Interpret a pictorial diagram.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Electronics
Grade Level: 9 - 12
LG 4 Capacitors

<table>
<tr><td colspan="2">High Priority Standards

MoDese Standards for Industrial Technology
Electronics
B. Test fundamental electronic circuits and devices in accordance with Industry and Safety Standards.</td></tr>
<tr><td>Learning Goal

Students will understand how capacitors perform different circuit functions in electrical devices.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Analyzing a capacitor’s ability to store electrical energy.
• Measuring capacitive reactance using defined units of measure.
• Measuring applied voltage using defined units of measure.
• Determining charging rate of a capacitor.
• Measuring total capacitance when capacitors are connected in parallel using defined units of measure.
• Testing a capacitor using defined units of measure.
• Interpreting technical documents and schematics related to electrical projects.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: Plate, dielectric, receivers, capacitors, direct current, Capacitance rating, farads, electrolytic</td></tr>
</table>

	capacitors, variable capacitors, time constant, voltage plate.
	• Performing processes such as:
	  o Identifying different kinds of capacitors.
	  o Determining charging rate of a capacitor.
	  o Discharging a capacitor.
	  o Explaining the importance of capacitor safety.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Explore a capacitor's ability to store electrical energy.
- Determine different kinds of capacitors.
- Measure capacitive reactance using defined units of measure.
- Measure applied voltage using defined units of measure
- Determine charging rate of a capacitor.
- Measure total capacitance when capacitors are connected in parallel using defined units of measure
- Discharge a capacitor and explain the importance for capacitor safety.
- Test a capacitor.
- Read and interpret technical documents and schematics related to electrical projects.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Electronics
Grade Level: 9 - 12
LG 5 Resistors

<table>
<tr><td colspan="2">High Priority Standards

MO Dese Standards for Industrial Technology
Electronics
B. Test fundamental electronic circuits and devices in accordance with Industry Standards.
K. Construct circuits consistent with industry and safety standards.

Missouri Learning Standards
MATH Number/Quantity 3
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (Interpreting resistor readings)</td></tr>
<tr><td>Learning Goal

Students will understand how to apply the principles of an electronic resistor.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Reading a resistor using its color code band.
• Interpreting the five bands of a carbon-composite resistor.
• Determining a resistors tolerance range and failure rate using OHMS scale.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: resistance, resistors (carbon-composite, film, wire-wound, metal glaze, fixed resistor, variable resistors, fusible resistors, potentiometers), values first stripe, values second</td></tr>
</table>

	stripe, values third stripe, tolerance value, failure rate, ohms, rheostats, potentiometers, power, wattage.
	• Performing processes such as:
	  ○ Identifying fixed resistors.
	  ○ Identifying carbon-composite resistors.
	  ○ Physically identifying other types of resistors.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify fixed resistors.
- Identify carbon-composite resistors.
- Physically identify other types of resistors.
- Read a resistor using its color code band.
- Know and interpret the five bands of a carbon-composite resistor.
- Determine a resistors tolerance range.
- Determine a resistors failure rate using ohms scale.
- Determine a resistors wattage rating or size of a resistor using ohms scale.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Electronics
Grade Level: 9 - 12
LG 6 Semiconductors

<table>
<tr><td colspan="2">High Priority Standards

MO Dese Standards for Industrial Technology
Electronics
G. Test equipment.
K. Construct circuits consistent with industry and safety standards.

Missouri Learning Standards
MATH
Statistics – Inference and Conclusion 6: Evaluate reports based on data. (Drawing conclusions from reports)</td></tr>
<tr><td>Learning Goal

Students will be able to test and evaluate semiconductors</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Evaluating and testing diodes.
• Evaluating and testing transistors (e.g., BJTs and FETs).
• Evaluating and testing thyristors (e.g., SCRs, TRIACs and DIACs).
• Using reports to draw conclusions from test results.
• Selecting semiconductors using specification sheets and substitution guides.
• Demonstrating proper semiconductor handling and replacing.

Level 2: Student demonstrates he/she is nearing proficiency by:</td></tr>
</table>

	• Recognizing and recalling specific vocabulary, such as: diodes, transistors, thyristors, semiconductors. • Performing processes such as: ○ Identifying a diode, transistor, and thyristor. (BJT, FET, SCR, TRIAC, and DIAC). Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Evaluate and test diodes.
- Evaluate and test transistors (e.g., BJTs and FETs).
- Evaluate and test thyristors (e.g., SCRs, TRIACs and DIACs).
- Read and make use of test results.
- Select semiconductors using specification sheets and substitution guides.
- Demonstrate proper semiconductor handling and replacing.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Electronics
Grade Level: 9 - 12
LG 7 Wiring and Tools

High Priority Standards

MO Dese Standards for Industrial Technology
Electronics
K. Construct Circuits Consistent With Industry And Safety Standards

Missouri Learning Standards
ELA
Reading Science and Technical areas 11-12.2
Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Learning Goal	Proficiency Scale
Students will understand procedures for working with electrical wiring systems	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Working with and repairing electrical cords, communications cables, and home electronic systems. • Designing, creating and troubleshooting circuits . • Soldering electrical components safely with different tools. • Reading and interpreting electrical wiring schematics.

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: safe current-carrying capacity, wire size, wire table, common wires, electrical cords, communication cables, pliers, wire strippers, plugs and jacks, wire nuts, microphone connectors, terminal strips and lugs, breadboards, solder, flux, soldering irons, soldering procedures, National Electrical Code, service drops, branch drops, wiring devices, switch boxes, junction boxes, surface-wiring devices, Inadequate wiring symptoms,
	• Performing processes such as:
	  ○ Explaining the purpose and history of the NEC (National Electronics Code)
	  ○ Determining wire and cable sizes.
	  ○ Identifying different wiring tool, plugs, jacks, terminals, clips, connectors and adapters.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Determine wire and cable sizes.
- Work with and repair electrical cords.
- Work with and repair communication cables.
- Identify different wiring tools, plugs, jacks, terminals, clips, connectors and adapters.
- Design, create and troubleshoot circuits on a breadboard.
- Solder electrical components safely with different tools.
- Work with most home electrical systems.
- Explain the purpose and history of the NEC (National Electronics Code).

- Describe the importance of adhering to the NEC.
- Interpret electrical wiring schematics

WGSD Curriculum
Industrial Technology Department

Course: Advanced Electronics
Grade Level: 10-12
LG 8 Electronic Circuits and Devices

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MoDese Performance Indicators for Electronics
Electronics
B. Test fundamental electronic circuits and devices in accordance with Industry and Safety Standards.
K. Construct circuits consistent with industry and safety standards.

Missouri Learning Standards
Math
Algebra –Creating Equations D.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law V = IR to highlight resistance R</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will be able to test fundamental electronic circuits and devices.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
Evaluating transformers, capacitors, inductors, and resistive devices to detect problems.
Evaluating basic circuit controls (e.g., switches, fuses, and circuit breakers) to detect problems.
Applying a recursive method of evaluation when working with electronic problems.</td></tr>
</table>

	• Applying Ohm's law.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: plate, dielectric, receivers, capacitors, direct current, Capacitance rating, farads, electrolytic capacitors, variable capacitors, time constant, voltage plate.
	• Performing processes such as:
	  ○ Identifying and testing sources of DC and AC signals and power.
	  ○ Testing DC circuits (e.g., parallel and series-parallel).
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Advanced Electronics
Grade Level: 10-12
LG 9 Semiconductors

High Priority Standards

MO Dese Standards for Industrial Technology
Electronics
G. Test equipment.
K. Construct circuits consistent with industry and safety standards.

Learning Goal	**Proficiency Scale**

Students will be able to test semiconductor devices consistent with industry and safety standards.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	• Evaluating diodes for problems or malfunctions.
	• Evaluating transistors (e.g., BJTs and FETs) for problems or malfunctions.
	• Evaluating thyristors (e.g., SCRa, TRIACs and DIACs) for problems or malfunctions.
	• Analyzing test results and repair voltage and current regulator circuits.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: diodes, transistors, thyristors, semiconductors, BJT, FET, SCRa, TRIAC, DIAC.
	• Performing processes such as:
	  ○ Evaluate and test batteries.
	  ○ Demonstrate proper semiconductor handling and replacing

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Advanced Electronics
Grade Level: 10-12
LG 10 Circuits

High Priority Standards

MO Dese Standards for Industrial Technology
Electronics
G. Test equipment.
K. Construct circuits consistent with industry and safety standards.

Learning Goal	Proficiency Scale
Students will be able to construct circuits consistent with industry and safety standards.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Evaluating IO devices such as such as keyboards, printers, and recording equipment. • Analyzing common optical devices such as photodetectors, emitters, optical isolators, and LEDs. • Constructing multistage circuits according to schematic diagrams. • Soldering and de-soldering components to IPC Standards. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: multimeter, current, optical devices, multistage circuits, IPC standards • Performing processes such as: ○ Testing and repairing audio and video systems.

	○ Measuring voltage, current and resistance. ○ Thru-hole soldering and de-soldering components. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Advanced Electronics
Grade Level: 10-12
LG 11 Advanced Safety

High Priority Standards

MO Dese Standards for Industrial Technology
Electronics
B. Appreciate and apply all personal and workplace safety procedures.

Missouri Learning Standards
ELA
Reading in Science and Technical areas 11-12.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (First aid manuals, electrical code manuals)

Learning Goal	Proficiency Scale

Students will be able to apply personal and workplace safety procedures in electrical construction environments.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	• Demonstrating safe use of AC line-operated equipment such as isolation transformers, grounding, leakage current testing, and GFCI.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: ground fault current interrupter (GFCI), current leakage, isolation transformer.
	• Performing processes such as:
	  ○ Identifying electrical hazards before beginning a job.
	  ○ Following first-aid procedures as directed by workplace and industry

	standards. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Robotics
Grade Level: 9-12
LG 1 The Nature of Technology

<table>
<tr><td colspan="2">High Priority Standards

International Technology Education Association <u>http://www.iteaconnect.org/TAA/PDFs/xstnd.pdf</u>
Standards for Technological Literacy : The Nature of Technology
Standard 1. Students will develop an understanding of the characteristics and scope of technology.
Standard 2. Students will develop an understanding of the core concepts of technology.
Standard 3. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.</td></tr>
<tr><td>Learning Goal

Students will understand the role of technology in our society.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Utilizing science in solving real problems.
• Utilizing technology in solving real problems.
• Utilizing mathematics in solving real problems.
• Applying types and properties of technological systems, such as open loop and closed loop.
• Comparing and identifying the relationships between technology, STEAM, and other disciplines.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: voltage, resistance, energy, science, technology, electronics, arts, mathematics.</td></tr>
</table>

	• Performing processes such as:
	  o Describing the role of technology in solving problems.
	  o Identifying factors that affect the development of technology.
	  o Recognizing the relationships between technology and other fields.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Solve real problem, such as:
  - Recognize and analyze alternative explanations and models.
  - Identify a problem.
  - Implement a solution.
  - Conduct systematic observation.
- Use technology to solve real problems, such as:
  - Construct models.
  - Evaluate technological design.
  - Use mechanisms – gears.
  - Use mechanisms - axles/wheels.
  - Program in Robot C for LEGO MINDSTORMS software.
- Use mathematics to solve real problems, such as:
  - Apply angles, ratios, and proportion to predict and robotic movement.
  - Informally and formally measure distance, time, speed, and work.
  - Utilize measurement of light sensors and threshold to demonstrate inequalities.
  - Utilize Boolean logic to program robots.
- Utilize mathematical knowledge through problem solving:
  - Solve problems that arise in mathematics and other contexts.
  - Apply and adapt a variety of appropriate strategies to solve problems.
  - Monitor and reflect on the process of problem solving.

WGSD Curriculum
Industrial Technology Department

- Analyze types and properties (e.g., open loop, closed loop) of technological systems.
- Analyze the relationship between technology, STEAM, and other disciplines.
- Examine robotic technology that is built upon a series of behaviors that can be measured mathematically and are understandable and predictable.
- Examine both robotics systems as a whole and as identifiable subsystems:
    - Navigation systems (e.g. sensor tells the robot where it is, programmable controller tells the robot how to interpret this information, motors move in order to achieve the desired result).
    - Sensing systems (electrical, mechanical, and programming elements of a sensor).
    - Power & transmission systems (motor, axle, gear, wheel).
    - Manipulator systems.
    - Lifting systems, vision systems, etc.
- Utilize robots to:
    - Apply systems concepts to make sensors, actuators, and other components work together.
    - Design processes take into account goals resources, and trade-off factors to achieve optimal results.
    - Apply technology exists in proper context alongside applications in science, math, and engineering.
    - Utilize several different technologies (e.g. desktop computer, USB/Bluetooth peripheral interface.
- Design mobile robotics controllers, electromechanical sensors and actuators) that are routinely used together in the operation of the MINDSTORMS robot system, and are necessary for it to work.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Robotics
Grade Level: 9-12
LG 2 Understanding of Design

High Priority Standards

International Technology Education Association ***http://www.iteaconnect.org/TAA/PDsF/xstnd.pdf***
Standards for Technological Literacy : Understanding of Design
Standard 8. Students will develop an understanding of the attributes of design.
Standard 9. Students will develop an understanding of engineering design.
Standard 10. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Standards for Technological Literacy : Abilities for a Technological World
Standard 11. Students will develop abilities to apply the design process.

Learning Goal	**Proficiency Scale**
Students will be able to apply engineering concepts to problem-solving.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Developing a strategy for envisioning and building a robot. • Building a robotic prototype. • Writing pseudo-code for the robot using Robot C. • Running trial runs with the robot. • Modifying the design or the programming as indicated by the trial runs. • Applying concepts associated with research and development, invention and innovation, and experimentation.

	• Applying characteristics of the iterative design process to solve problems. • Applying strategies for to integrate science, mathematics, and technology to solve engineering design problems. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: abutment, activation, amplitude, analysis, angle, assembly, automation, axis, balance, bearing, blueprint, calculation, cantilever, combustion, component, compress, constriction, construction, control, conversion, conveyance, cooling, coupling, crank, current, degree, diagram, electrical, element, energy, engine, excavation, expert, fabrication, flexible, flow, fluid, force, frame, fuel, fulcrum, gimbals, hoist, horizontal, hydraulic, instrument, intersection, joint, lift, load, machine, mechanize, motion, object, operation, physics, plumb, pneumatic, precision, process, production, project, propulsion, pulley, radiate, ream, refine, regulation, retrofit, rotation, scheme, schooling, scientific, sequence, shape, slide, stability, strength, structure, superstructure, suspension, technology, tools, transform, transmission, transmit, turbine, vacuum, valve, vertical, vibration, weight, weld, withstand • Performing processes such as: o Demonstrating a basic understanding of the process of prototyping, writing pseudo code, trial and error, and receiving feedback. o Formulating an engineering goal. o Identifying robotic construction techniques and parts. o Identify steps in revision of a project. o Reflecting on feedback and results. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

The student knows how to:

- Envision what the robot will be like and what it will do.
- Build a prototype.
- Write a program for the prototype using "pseudo-code".
- Run trials of the robot to see if it will do what it has been designed for-(Prototyping Round 2).
- Design modifications and/or program modifications.
- Receive feedback and reflect on feedback.
- Apply concepts associated with research and development, invention and innovation, and experimentation.
- Identify steps in the iterative design process.
- Apply characteristics of the iterative design process to solve problems.
- Apply strategies to integrate science, mathematics, and technology to solve engineering design problems.

Learning Design

Students will self-select an engineering problem with instructor approval.

- Students will work in pairs to identify and design a physical computer to interact with the real world and attempt to overcome the problem.
- Students will create a PERT chart before construction of the robot.
- Students will maintain an engineering journal throughout the project.
- Student is able to demonstrate understanding of Robot C code syntax and structure.
- Students can demonstrate and define usage of C-based source code editor (an industry standard C-programming language); software debugger tools allowing the user to see the real time states of all motors and sensor, demonstrate both autonomous and user control of robots. Differentiation can be achieved via basic and expert modes targeting both novice and advanced students.
- Student is able to successful and precisely controls movement of the robot through a minimum of two motors and Robot C programing instructions.

Student is able to control movement of the robot through a minimum of two motors and Robot C programing instructions.

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Robotics
Grade Level: 9-12
LG 3 Abilities for a Technological World

<table>
<tr><td colspan="2">High Priority Standards

International Technology Education Association http://www.iteaconnect.org/TAA/PDF/xstnd.pdf
Standards for Technological Literacy: Abilities for a technological world.

12. Using and maintaining technological products and systems.
13. Assessing the impact of products and systems.</td></tr>
<tr><td>Learning Goal

Students will be able choose, use, and maintain advanced technological tools at school and in the workplace.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Developing and applying an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
• Utilizing programming software to demonstrate robotic movement.
• Applying programming software functions functions, such as interacting with robotic microcontrollers, producing data graphs, connecting peripheral interfaces, and connecting electromechanical systems and actuators.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: Robot C software, behaviors, Boolean Logic, display text, encoder, flowcharts & pseudo code, functions, global variables, if-else statement, bluetooth adapter, joystick controller, motor synchronization, pid speed control, random numbers, reserved words, running a</td></tr>
</table>

	program, sense-plan-act, switch-case statement, TETRIX Servos, thresholds, timers, variables and data types, while loops, and whitespace.
	• Performing processes such as:
	  ○ Selecting and using the appropriate tool for a given purpose.
	  ○ Applying procedure to maintain technological systems.
	  ○ Correctly and safely operating tools and machines.
	  ○ Using robotic sensing functions and interacting with the environment using various advanced sensors.
	  ○ Identifying mathematical and computer science concepts to solve real world engineering problems.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Demonstrate knowledge of the correct and safe operation of tools and machines.
- Select an appropriate tool or machine for a given purpose.
- Demonstrate knowledge of measurement units and instruments.
- Apply principles of troubleshooting to ensure safe and proper operation of technological systems.
- Demonstrate knowledge of procedures for maintaining technological systems.
- Demonstrate knowledge of federal and state health and safety regulations and agencies (e.g., OSHA, EPA, DNR).
- Move the robot forward.
- Program a proportional-integral-derivative (PID) controller as a feedback mechanism.
- Program various levels of Motor Power.
- Use encoders to converts information from one format to another, for the purposes of standardization, speed, and accuracy.
- Demonstrate robotic sensing and interaction with the environment utilizing various sensors like Touch, Sound, Ultrasonic, Light Sensor, and color sensors.

- Demonstrate robotic sensing and interacting with the environment utilizing various advanced sensors like: angle, acceleration, tilt, barometric, electro Optical Proximity Detector (EOPD), Gyro, force, and compass.
- Use mathematical and computer science concepts to solve real world engineering problems such as while loops , sense-plan-act algorithm automatic thresholds, values and variables, text to display, automatic calculations, automatic thresholds, variables and functions/counting, global variables, bluetooth connections, and remote control.
- Work with many important technologies as part of the operation of the Robot C system:
    - Electronic microcontrollers.
    - Desktop/laptop computer and software (Robot C Programming Software, word processor for write ups, spreadsheets for data graphs).
    - Peripheral interfaces (USB or Bluetooth wireless).
    - Electromechanical systems (touch, light, rotation, sound, ultrasonic sensors).
    - Electromechanical actuators (Interactive Servo Motors).

WGSD Curriculum
Industrial Technology Department

Course: Introduction to Robotics
Grade Level: 9-12
LG 4 The Designed World

<table>
<tr><td colspan="2">High Priority Standards

International Technology Education Association <u>http://www.iteaconnect.org/TAA/PDsF/xstnd.pdf</u>
Standards for Technological Literacy: The Designed World.
Standard 16. Students will develop an understanding of and be able to select and use energy and power technologies.
Standard 17. Students will develop an understanding of and be able to select and use information and communication technologies.
Standard 19. Students will develop an understanding of and be able to select and use manufacturing technologies.
Standard 20. Students will develop an understanding of and be able to select and use construction technologies.</td></tr>
<tr><td>Learning Goal

Students will understand the multiple roles of technology.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
Analyzing careers and career development in Robotics.
Utilizing drafting and graphic communication tools in robot design.
Applying the principles of electronic communication and of information and communications technologies in robot design.
Applying the principles of energy and power, and energy and power technologies in robot design.
Level 2: Student demonstrates he/she is nearing proficiency by:
Recognizing and recalling specific vocabulary, such as: actuator, algorithm, axis, base, CAD, Cartesian topology, clam, closed loop, control, dead man switch, error, encoder, feedback control, , gripper, inductive sensors, kinematics laser,</td></tr>
</table>

	link, optical encoder, pick and place, real-time, reliability, repeatability, robot, sensor, servo, simulation, tool, vision sensor.
	• Performing processes such as:
	  o Identifying career opportunities in industry, technology, and engineering.
	  o Applying basic drafting concepts.
	  o Identifying concepts of electronics use to analyze series and parallel circuits and interpret schematics.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Investigate the various fields in which robotics have been used.
  - Identify career opportunities in industry, technology, and engineering.
  - Apply knowledge of sources of information about technology careers; and personal interests, education, and experience needed for careers in technology and engineering.
  - Apply knowledge of career-planning strategies and skills related to job search and job acquisition.
  - Demonstrate knowledge of career, technical, student, and professional organizations related to technology engineering.

- Utilize drafting and graphic communication tools:
  - Use drawings in graphic design and drafting (e.g., thumbnail, sometric, orthographic).
  - Use the elements (e.g., color, shape) and principles (e.g., proportion, balance, symmetry) of graphic design.
  - Apply basic drafting concepts (e.g., drafting tools, alphabet of lines).
  - Use software for Computer-aided design (CAD).
  - Use techniques such as storyboarding and image processing in the design and creation of communication products.
  - Choose from a variety of representations to best illustrate and communicate a point using many different formats of both technical and nontechnical information, across different media:
    - Graphs

- Charts
- Tables/Matrices
- Photographs
- Sketches
- Timelines
- PERT and Gantt Charts
- Multimedia presentation
- Text

- Apply the principles of electronic communication:
  - Concepts of electronics (e.g., voltage, resistance, energy) use to analyze series and parallel circuits and interpret schematics.
  - Characteristics of electromagnetic waves and analog communication system.
  - Analyze characteristics of digital circuits and digital communication system.
  - Analyze characteristics of a variety of electronic communication systems (e.g., telephone, satellite, radio, computer).

- Apply knowledge of energy and power technologies:
  - Technologies and processes for the transmission and control of power and energy.
  - Various robotic systems.
  - Concepts of work, potential energy, kinetic energy, and power.
  - Mechanical power systems and their components (e.g. Pulleys and belts, gear systems).

WGSD Curriculum
Industrial Technology Department

Course: Advanced Robotics
Grade Level: 10-12
LG 5 Using Software

<table>
<tr><td colspan="2">High Priority Standards

International Technology Education Association <u>http://www.iteaconnect.org/TAA/PDsF/xstnd.pdf</u>
Standards for Technological Literacy : Abilities for a Technological World
Standard 11. Students will develop abilities to apply the design process.
Standard 12. Using and maintaining technological products and systems.
Standard 13. Assessing the impact of products and systems.</td></tr>
<tr><td>Learning Goal

Students will be able to apply advanced programming skills to the engineering process.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
Creating a vision for what the robot will be like and what it will do.
Building a prototype.
Writing a program-writing “pseudo-code” in an advanced software environment.
Running trials of the robot to see if it will do what it has been designed for (Prototyping Round 2).
Designing modifications and/or program modifications.
Reflecting on feedback and finishing the robot.
Applying characteristics of the iterative design process to solve problems.
Level 2: Student demonstrates he/she is nearing proficiency by:
Recognizing and recalling specific vocabulary, such as: LabVIEW for LEGO MINDSTORMS software, abutment, activation, amplitude, analysis, angle,</td></tr>
</table>

	assembly, automation, axis, balance, bearing, blueprint, calculation, cantilever, combustion, component, compress, constriction, construction, control, conversion, conveyance, cooling, coupling, crank, current, degree, diagram, electrical, element, energy, engine, excavation, expert, fabrication, flexible, flow, fluid, force, frame, fuel, fulcrum, gimbals, hoist, horizontal, hydraulic, instrument, intersection, joint, lift, load, machine, mechanize, motion, object, operation, physics, plumb, pneumatic, precision, process, production, project, propulsion, pulley, radiate, ream, refine, regulation, retrofit, rotation, scheme, schooling, scientific, sequence, shape, slide, stability, strength, structure, superstructure, suspension, technology, tools, transform, transmission, transmit, turbine, vacuum, valve, vertical, vibration, weight, weld, withstand • Performing processes such as: o Applying concepts associated with research and development, invention and innovation, and experimentation. o Identifying steps in the iterative design process. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Simplified Automotive Maintenance
Grade Level: 10-12
LG 1 Shop Safety

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology:
Introduction to Automotive Technology
A. Safety</td></tr>
<tr><td>Learning Goal

Students will be able to keep themselves safe in a working shop environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Applying safety skills when using hand and power tools in all situations.
• Complying with all personal and environmental safety regulations that apply to the shop environment.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: combination wrench, screwdriver, pliers, hammer, socket, ratchet, punch, chisel, fire extinguisher (A,B,C,D), drill motor, drill bit, grinder, safety glasses, lift, jack, jack stand, impact wrench, blowgun.
• Performing processes such as:
o Identifying safe ways to use hand and power tools.
o Identifying and describing the situations that call for protective</td></tr>
</table>

	equipment. ○ Knowing that regulations from all levels of government exist for shop environments. ○ Using personal protective equipment in the shop environment (i.e., clothing and safety glasses). ○ Identifying and describing how fire protection equipment is used. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Demonstrate the safe use of hand tools.
- Demonstrate the safe use of power tools.
- Practice the safe use of personal protective equipment (ie., clothing and safety glasses).
- Describe how to use fire protection equipment safely.
- Demonstrate the safe use of shop equipment.

WGSD Curriculum
Industrial Technology Department

Course: Simplified Automotive Maintenance
Grade Level: 10 -12
LG 2 Career Skills

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology
B. Shop Operation
C. Employability Skills
D. Leadership Competencies

Missouri Learning Standards
ELA: Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.

Learning Goal	Proficiency Scale
The student will be able to apply the skills needed to work in a shop environment.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Conducting specified searches to locate vehicle and service information. • Maintaining a good work ethic (i.e., relations with others, dependability, attitude, and personal hygiene). • Displaying the skills of teamwork, etiquette and courtesy in the shop environment.

	Level 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing and recalling specific vocabulary, such as: make, manufacture, model, body style, chassis, ethics, responsibility, respect, attitude, teamwork. ● Performing processes such as: o Identifying attitudes and skills that contribute to a positive shop environment. o Identifying what vehicle and service information needs to be researched. o Identifying make, model, year, and chassis of vehicles needing service. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify make and model of vehicles to facilitate accurate research into needed information.
- Research applicable vehicle and service information.
- Demonstrate a good work ethic (i.e., relations with others, dependability, attitude, and personal hygiene).
- Demonstrate teamwork.
- Demonstrate etiquette and courtesy.
- Develop and maintain a code of professional ethics.

WGSD Curriculum
Industrial Technology Department

WGSD Curriculum
Industrial Technology Department

Course: Simplified Automotive Maintenance
Grade Level: 10 -12
LG 3 Steering and Suspension

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology

IV. Steering and Suspension
- A. General suspension and steering systems diagnosis.
- B. Steering systems diagnosis and repair.
- C. Suspension systems diagnosis and repair.
- D. Related suspension and steering service.
- E. Wheel Alignment.
- F. Wheel and tires.

Missouri Learning Standards

ELA: Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (Finding and using vehicle service records and service manuals and bulletins).

Learning Goal	Proficiency Scale
Students will be able to inspect and diagnosis issues in vehicle steering systems.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Interpreting necessary information to determine repair actions in suspension and steering systems in accordance with industry standards. • Diagnosing problems in power steering components and fluids in accordance

	with industry standards. • Diagnosing problems in suspension system joints, balls, coil springs, stabilizer bars, bushings and brackets in accordance with industry standards. • Diagnosing problems in shock absorbers, wheel bearings and other components of suspension and steering mechanisms. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: spring, ball joint, tie-rod, drag (center), link, idler arm, pitman arm, control arm, stabilizer bar, bushing, belt, pump, hose, power steering fluid, shock absorber, McPhearson strut, zerk fitting . • Performing processes such as: o Identifying correct service information and vehicle service bulletins. o Describing needed repair actions for suspension and steering systems. o Performing routine maintenance on automotive steering and suspension systems. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify and interpret suspension and steering system concerns; determine necessary action.
- Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins.
- Identify power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns.
- Identify power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns.
- Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.

- Determine proper power steering fluid type; inspect fluid level and condition.
- Fill power steering system.
- Identify power steering fluid leakage; determine necessary action.
- Remove, inspect, replace, and adjust power steering pump belt.
- Check power steering pulley and belt alignment.
- Inspect pitman arm, relay (center link/intermediate) rod, idler arm mountings, and steering linkage.
- Inspect upper and/or lower ball joints.
- Inspect steering knuckle assemblies.
- Inspect short and long arm suspension system coil springs.
- Inspect suspension system torsion bars; inspect mounts.
- Inspect stabilizer bar bushings, brackets, and links.
- Inspect strut cartridge or assembly and strut coil spring.
- Inspect shock absorbers.
- Inspect front and rear wheel bearings.
- Lubricate suspension and steering systems.

WGSD Curriculum
Industrial Technology Department

Course: Simplified Automotive Maintenance
Grade Level: 10 -12
LG 4 Wheels and Tires

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology

IV: Steering and Suspension
E. Wheel Alignment Diagnosis, Adjustment, and Repair.
F. Wheel and Tire Diagnosis and Repair.</td></tr>
<tr><td>Learning Goal

Students will be able to maintain safe operation of automotive wheel and tire systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Diagnosing problems with wheels and tires.
• Maintaining tires and wheels to meet road safety regulations.
• Inspecting, balancing, repairing and replacing tire and wheel components.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: wander, drift, pull, caster, camber, toe, air pressure, normal wear, abnormal wear, torque wrench, wheel fastener, section width, aspect ratio, bead, bead seat, steel belt, ply, valve stem, wheel weight, patch, plug.
• Performing processes such as:</td></tr>
</table>

	○ Describing potential problems with wheels and tires. ○ Checking air pressure. ○ Assisting with tire dismount and remount, wheel balancing and tire assembly, and reinstalling wheels. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Diagnose vehicle wander, drift, and pull.
- Preform pre-alignment inspection.
- Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action.
- Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
- Rotate tires according to manufacturer's recommendations.
- Diagnose tire pull problems; determine necessary action.
- Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.
- Reinstall wheel; torque lug nuts.
- Inspect tire and wheel assembly for air loss; perform necessary action.
- Repair tire using internal patch.

WGSD Curriculum
Industrial Technology Department

Course: Simplified Automotive Maintenance
Grade Level: 10 -12
LG 5 Brakes

High Priority Standards

MoDese Standards for Industrial Automotive Technology
Introduction to Automotive Technology
V. Brakes

A. General brake systems diagnosis and evaluation in accordance with industry standards.
B. Hydraulic system diagnosis and repair.
C. Drum brake system and diagnosis and repair.
D. Disc brake system diagnosis and repair.
F. Miscellaneous diagnosis and repair.
G. Electronic brake and traction control systems.

Missouri Learning Standards
ELA-Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (Interpreting technical documentation related to repairs.)

Learning Goal	**Proficiency Scale**
Students will be able to evaluate and diagnose problems with automotive brake systems.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Interpreting general brake system concerns. • Locating and interpreting vehicle and major component identification numbers

	using diagrams, schematics, and online resources. • Interpreting hydraulic, drum, and disc brake systems problems. • Performing routine maintenance all brake systems. • Interpreting electronic brake system concerns. Level 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing and recalling specific vocabulary, such as: shimmy, pulsation, grinding, diagram, part number, pads, rotor, caliper, hose, pipe, shoe, drum, wheel cylinder, master cylinder, combination valve, proportioning valve, metering valve, brake fluid, DOT (Department of Transportation), brake cable, bearing, ABS, traction control, vehicle stability control. • Performing processes such as: o Identifying brake system concerns. o Locating ID numbers for parts needed. o Describing different types of brakes and brake systems found in automobiles. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify and interpret brake system concerns and determine necessary action.
- Locate and interpret vehicle and major component identification numbers to find parts.
- Check master cylinder for external leaks.
- Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports, determine necessary action.
- Select, handle, store, and fill brake fluids to proper level.
- Identify poor stopping, noise, vibrations, pulling, grabbing, dragging or pedal pulsation concerns.
- Remove, clean, inspect, and measure brake drums; determine necessary action.
- Refinish brake drum; measure final drum diameter.
- Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, and other related brake hardware, and backing support plates; lubricate and reassemble.
- Inspect wheel cylinders.
- Install wheel, torque lug nuts, and make final checks and adjustments.
- Remove caliper assemble; inspect for leaks and damage to caliper housing.
- Clean and inspect caliper mounting and slide/pins for operation, wear, and damage; determine necessary action.
- Remove, inspect, and replace pads and retaining hardware; determine necessary action.
- Remove and reinstall rotor.
- Refinish rotor off vehicle, measure final rotor thickness.
- Check brake pad wear indicator system operation; determine necessary action.
- Check operation of brake stop light systems.
- Identify and inspect electronic brake control system components.
- Identify poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with electronic brake control system.
- Identify traction control/vehicle stability control system components.

WGSD Curriculum
Industrial Technology Department

Course: Simplified Automotive Maintenance
Grade Level: 10 -12
LG 6 Charging Systems

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
Automotive Technology
VI. Electrical/Electronic Systems
A. General Electrical System Diagnosis.
B. Battery Diagnosis and Service.
C. Starting System Diagnosis and Repair.
D. Charging System Diagnosis and Repair.
E. Lighting System Diagnosis and Repair.</td></tr>
<tr><td>Learning Goal

Students will be able to maintain safe operation of automotive starting and charging systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Inspecting, testing, and maintaining all the following automotive systems:
o General electrical system components.
o Battery and battery systems.
o Starting systems.
o Charging systems.
o Lighting systems.

Level 2: Student demonstrates he/she is nearing proficiency by:</td></tr>
</table>

	• Recognizing and recalling specific vocabulary, such as: battery, alternator, cable wire, conductor, insulator, belt, volts, fuse, switch, bulb, motor, crimp, heat shrink, solder, discharge, acid, short, open, pulley, tensioner, jumper cable, booster pack, cold cranking amps, cranking amps.
	• Performing processes such as:
	  ○ Identifying major components of the systems listed in level 3.
	  ○ Using meters and circuit testers accurately.
	  ○ Safely connecting and charging a low battery.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify and interpret electrical/electronic systems concern and determine necessary action.
- Locate and interpret vehicle and major component identification numbers.
- Demonstrate proper use of a digital multi-meter (DMM).
- Check electrical circuits with a test light.
- Inspect and test fusible links, circuit breakers, and fuses.
- Inspect and test wires of electrical/electronic circuits.
- Remove and replace terminal end from connector; replace connectors and terminal ends.
- Repair wiring harness.
- Perform solder repair of electrical wiring.
- Perform battery state-of-charge test and determine necessary action.
- Perform battery capacity test and confirm proper battery capacity for vehicle application.
- Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs.
- Perform battery charge.
- Start vehicle using jumper cables or an auxiliary power supply.

- Perform charging system output test.
- Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
- Diagnose the cause of intermittent, dim, or no light operations.
- Inspect, replace, and aim headlights and bulbs.
- Inspect and diagnose incorrect turn signal or hazard light operation.

WGSD Curriculum
Industrial Technology Department

Course: Simplified Automotive Maintenance
Grade Level: 10 -12
LG 7 Engine Performance

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
Automotive Technology
VIII. Engine Performance
A. General Engine Diagnosis.
C. Ignition System Diagnosis and Repair
D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair.
E. Emissions Control Systems and Diagnosis.
F. Engine Related Services.</td></tr>
<tr><td>Learning Goal

Students will understand engine performance and drivability.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Interpreting and evaluating problems, and determining actions for these automotive systems:
o Computerized engine controls.
o Ignition systems.
o Fuel, air inductions and exhaust systems.
o Emission controls.
• Applying mechanical skills needed to repair diagnosed problems.</td></tr>
</table>

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: drivability, no start, crank, hard start, spark plug, spark plug wire, coil, gasoline, engine oil, thermostat, antifreeze/coolant, radiator, pressure cap, coolant recovery, hose, hose clamp, fuel filter, air filter, oil filter, fuel economy.
	• Performing processes such as:
	  ○ Checking and replacing fuels, lubricants and filters.
	  ○ Changing oil and oil filters.
	  ○ Replacing air filters.
	  ○ Identifying abnormal engine conditions, such as excess noise or exhaust.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Identify and interpret engine performance concerns.
- Locate and interpret vehicle and major component identification numbers.
- Inspect engine assembly for fuel, oil, coolant, and other leaks.
- Identify abnormal engine noise or vibration concerns.
- Identify abnormal exhaust color, odor, and sound.
- Verify engine operating temperature.
- Check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses.
- Identify ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability.
- Replace fuel filters.
- Inspect air induction system.
- Replace air filter.

- Inspect and replace cabin air filter.
- Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.
- Diagnose oil leaks.
- Perform engine oil and filter change.

WGSD Curriculum
Industrial Technology Department

Course: Power Technology
Grade Level: 11-12
LG 1 Shop Safety

<table>
<tr><th colspan="2">High Priority Standards

MoDese Performance Indicators for Small Engine Technician:
1. Basic Personal Safety
2. Lab and Tool Safety</th></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will be able to keep themselves safe in a working shop environment.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Applying industry regulated safety processes in shop situations when working with tools, chemicals, and safety equipment.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: combination wrench, screwdriver, pliers, hammer, socket, ratchet, punch, chisel, fire extinguisher (A,B,C,D), drill motor, drill bit, grinder, safety glasses, lift, jack, jack stand, impact wrench, blowgun, hazards, solvent, flammable, goggles, earplugs, carbon monoxide, OSHA, vise micrometer.
• Performing processes such as:
o Identifying safe ways to use hand and power tools.
o Identifying and describing the situations that call for protective</td></tr>
</table>

<table>
<tr>
<td></td>
<td>equipment.
o Knowing that regulations from all levels of government exist for shop environments.
o Using personal protective equipment in the shop environment (i.e., clothing and safety glasses).
o Identifying and describing how fire protection equipment is used.
o Identifying chemicals used to clean and maintain automotive parts.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td>
</tr>
<tr>
<td colspan="2">Learning Targets

The student knows how to:
• Demonstrate safe work habits.
• Demonstrate the safe handling of hazardous materials.
• Recognize industry accepted procedures for using proper safety devices such as lock out/tag and blocking devices.
• Use basic personal safety habits.
• Demonstrate proper lifting practices.
• Demonstrate safe use of lifting and hoisting devices.
• Maintain a clean and safe work area.
• Demonstrate the safe and proper use of hand tools.
• Demonstrate the safe and proper use of power tools.
• Identify the proper use of fire extinguishers.
• Recognize standard emergency evacuation procedures.
• Identify fire hazards.
• Identify spill containment.
• Demonstrate safe use of cleaning equipment and chemicals.</td>
</tr>
</table>

WGSD Curriculum
Industrial Technology Department

Course: Power Technology
Grade Level: 11-12
LG 2 Diagnosing Issues

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Small Engine Technician:
3. Lab procedures.
6. Engine/product identification.

Missouri Learning Standards
ELA: Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (Finding and using vehicle service records and service manuals and bulletins).</td></tr>
<tr><td>Learning Goal

The student will be able to diagnose and perform mechanical repairs.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Conducting specified research to locate vehicle and service information.
• Interpreting parts and service manuals.
• Interpreting and verifying the complaint.
• Displaying the skills of teamwork, etiquette and courtesy in the shop environment.
• Applying safety and emissions compliance standards to the shop environment.

Level 2: Student demonstrates he/she is nearing proficiency by:</td></tr>
</table>

	● Recognizing and recalling specific vocabulary, such as: work order, service manual, make, model, serial number, type number, code number, CO, CO2, HC, NOx, parts manual, flywheel brake.
	● Performing processes such as:
	  o Identifying what vehicle and service information needs to be researched.
	  o Identifying name, manufacturer, model, serial number, and type of engines.
	  o Identifying problem areas for conditions such as; no start, engine noise, leaks, excessive oil consumption, and unusual exhaust conditions.
	  o Documenting work and supplies used on work orders.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Document service work and supplies on work orders.
- Read and interpret service and parts manuals.
- Use basic computer skills.
- Identify the name, manufacturer, model, serial number, and type of engines.
- Identify emission compliance engines.
- Identify safety compliance parts.

WGSD Curriculum
Industrial Technology Department

Course: Power Technology
Grade Level: 11-12
LG 3 Tools and Fasteners

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Small Engine Technician:

4. Tools and equipment.
5. Fasteners.</td></tr>
<tr><td>Learning Goal

Students will be able to work with automotive tools and fasteners.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Choosing the correct fasteners for a corresponding job based on industry standards.
• Using measuring and diagnostic tools to take accurate readings for repair work.
• Evaluating damaged bolt and screw thread and choosing the correct tools for repair.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: combination wrench, flare nut wrench, ratchet, socket, extension, universal, screwdrivers, hammers, pliers, torque wrench, snap ring pliers, punches, chisels, pullers, vise,</td></tr>
</table>

	micrometer, dial indicator, bore gauge, telescoping gauge, caliper, square, drill, impact wrench, grinder, tap, die, test light, DVOM, screw, bolt, nut, lock washer, flat washer, fastener grade, pitch, gasket, RTV, thread sealant.
	• Performing processes such as:
	  o Identifying, sizing, and measuring metric and standard fasteners.
	  o Identifying the different fasteners used for corresponding types of engine and repair work.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Identify industry-related hand tools.
- Demonstrate the proper use of hand tools.
- Identify precision measuring tools and equipment.
- Demonstrate the proper use and care of precision measuring tools and equipment.
- Identify industry-related power tools.
- Demonstrate the proper use and care of industry-related power tools.
- Identify and use tools to restore threads on fasteners.
- Identify diagnostic tools.
- Demonstrate the proper use and care of diagnostic tools.
- Identify and select industry-related fasteners.
- Measure bolts and threads (SAE grade and metric).
- Determine proper torque value for fasteners.
- Demonstrate proper torqueing technique for fasteners.
- Identify and select proper gaskets and sealants.

WGSD Curriculum
Industrial Technology Department

Course: Power Technology
Grade Level: 11-12
LG 4 Engine Theory and Construction

<table>
<tr><th colspan="2">High Priority Standards

MoDese Performance Indicators for Small Engine Technician:
6. Four –Stroke Cycle Engines</th></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand four-stroke cycle engine theory and construction.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Disassembling, inspecting and servicing, and reassembling a four-stroke cycle engine.
• Explaining the operating cycle of a four-stroke engine.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: four-stroke cycle, block, cylinder head, crankshaft, camshaft, connecting rod, piston, piston rings, piston (wrist) pin, lifters, valves, valve springs, valve spring retainer, crankcase cover, oil pump, flywheel, carburetor, muffler, air filter.
• Performing processes such as:
o Inspecting engine parts for possible repairs needed.
o Identifying how the engine operates.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Describe the operating cycle of the four-stroke cycle engine.
- Disassemble a four-stroke cycle engine.
- Inspect and service a cylinder.
- Inspect and service the pistons, rings and connecting rods.
- Inspect and service a crankshaft assembly.
- Inspect and service a valve train assembly.
- Reassemble a four-stroke cycle engine
- Identify the difference between l-head and overhead valve trains.
- Test compression.

WGSD Curriculum
Industrial Technology Department

Course: Power Technology
Grade Level: 11-12
LG 5 Troubleshooting

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Small Engine Technician:
10. Troubleshooting.
23. Failure analysis.</td></tr>
<tr><td>Learning Goal

Students will understand the process of troubleshooting as a systematic approach to identify failures.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Conducting a planned and thorough sequence of tests and examinations to eliminate possible sources of trouble in an engine.
• Classifying symptoms and test results to determine operational problems.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: service manual, specifications, symptoms, systems, verify complaint, verify repairs, fuel, fuel system, ignition system, lubrication, contamination, spark plug, flywheel key, vacuum, abrasive, overheating, vibration.
• Performing processes such as:</td></tr>
</table>

	○ Identifying symptoms of engine failure. ○ Making repairs and retesting to determine success. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Identify the system and components.
- Recognize the sequences of events in a system.
- Access technical manuals to find information and specifications.
- Identify exact symptoms.
- Accurately separate systems.
- Make a complete physical examination.
- Replicate or simulate a given problem.
- Determine and classify all symptoms.
- Perform specific tests using tools to determine which components work correctly.
- Make repairs and retest to verify the repair.
- Identify the effects of abrasive ingestion on engine components.
- Identify the entrance path of abrasives on several engine failure examples.
- Identify the effects of overheating on engine component parts.
- Identify engine failure caused be lean mixture.
- Identify the effects of over speeding on engine component parts.
- Identify the signature break on a connected rod on several engine failure examples.

Identify the effects of excessive vibration on engine block and mounting base.

WGSD Curriculum
Industrial Technology Department

Course: Power Technology
Grade Level: 11-12
LG 6 Carburetors

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Small Engine Technician:
11. Fuel Systems.
12. Governor System.</td></tr>
<tr><td>Learning Goal

Students will understand operation and components of carburetor fuel systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Servicing all components of the fuel system to repair and or/maintain optimal running conditions.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: carburetor, fuel filter, fuel pump, fuel hose/pipe, fuel tank, air filter, gasoline, octane, diaphragm, gravity, governor, air vane, centrifugal force, RPM, rich fuel mixture, lean fuel mixture, CARB, EPA, idle, cold start, hot start, acceleration, vacuum, venture principle, choke, float, primer.
• Performing processes such as:
o Identifying systems such as fuel, air, venting, and governor.
o Servicing all filters and air cleaners found in typical engines.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Test, repair, or replace diaphragm type carburetors.
- Test, repair, or replace fuel filters and strainers.
- Remove, clean, and replace fuel tank, shut-off valves, fuel lines, fuel hoses, and connections.
- Clean, rebuild, or replace diaphragm type carburetors.
- Clean, rebuild, or replace float type carburetors.
- Service oil-foam air cleaner.
- Service dry-element air cleaner.
- Properly dispose of contaminated fuel.
- Identify the types and grades of gasoline used in power equipment.
- Describe the use of a fuel additive for storage.
- Identify fuel venting systems.
- Troubleshoot a fuel system.
- Identify the purpose of the governor systems.
- Inspect, adjust, and repair air-vane governor systems.
- Inspect, adjust, and repair mechanical governor systems and linkages.
- Adjust engine RPMs to manufacturer’s specifications.
- Troubleshoot a governor system.

WGSD Curriculum
Industrial Technology Department

Course: Power Technology
Grade Level: 11-12
LG 7 Electrical Systems

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Small Engine Technician:
13. Electrical Systems</td></tr>
<tr><td>Learning Goal

Students will understand components and operation of basic electrical and starting systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining electrical theory as relates to small engine functions.
• Explaining how batteries store energy.
• Explaining different types of circuits and how they can malfunction.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: conductor, insulator, circuit, volts, ohms, coil, electrode, ignition, battery, transformer, magneto, gap, DVOM, fuse, fusible link, continuity, gauge, switch, alternator, continuity, gauge, switch, alternator, corrosion, resistance, plate, alternator, corrosion, resistance, plat, sulfating, sulfuric acid, hydrogen gas, multimeter, starter, solenoid, flywheel.</td></tr>
</table>

	• Performing processes such as:
	  o Identifying terminals, connectors, and electrical wire sizes.
	  o Checking continuity in circuits.
	  o Removing, cleaning, and replacing batteries.
	  o Inspecting, testing, and replacing fusible links, fuses, and circuit breakers.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Demonstrate safe work habits when working with electrical systems.
- Explain basic electrical theory.
- Describe series circuit.
- Describe parallel circuit.
- Explain different types of circuit failures.
- Check continuity in circuits and electrical system components.
- Identify terminals and connectors used in electrical systems.
- Identify electrical wire sizes.
- Read and interpret electrical meters.
- Test, repair, and/or replace charging system components.
- Replace fuel system, lubrication, safety, and temperature sending units.
- Explain storage battery theory and operation.
- Remove, clean, and replace battery.
- Determine battery state of charge using DMM (Digital Multimeter)
- Troubleshoot an electrical system.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 1 Shop Safety

High Priority Standards

MoDese Performance Indicators for Automotive Technology:
Introduction to Automotive Technology

B. Safety

Learning Goal	**Proficiency Scale**
Students will be able to keep themselves safe in a working shop environment.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Applying safety skills when using hand and power tools in all situations. • Complying with all personal and environmental safety regulations that apply to the shop environment. • Applying safety skills when handling chemicals for all applications. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: combination wrench, screwdriver, pliers, hammer, socket, ratchet, punch, chisel, fire extinguisher (A,B,C,D), drill motor, drill bit, grinder, safety glasses, lift, jack, jack stand, impact wrench, blowgun, solvent, acid, caustic, brake parts cleaner, carburetor cleaner, lithium, penetrant, mineral spirits, thinner, reducer, catalyst. • Performing processes such as:

	○ Identifying safe ways to use hand and power tools. ○ Identifying and describing the situations that call for protective equipment. ○ Knowing that regulations from all levels of government exist for shop environments. ○ Using personal protective equipment in the shop environment (i.e., clothing and safety glasses). ○ Identifying and describing how fire protection equipment is used. ○ Identifying chemicals used to clean and maintain automotive parts. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Demonstrate the safe use of hand tools.
- Demonstrate the safe use of power tools.
- Practice the safe use of personal protective equipment (ie. clothing and safety glasses).
- Describe how to use fire protection equipment safely.
- Demonstrate the safe use of shop equipment.
- Describe how to use chemicals safely.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 2 Career Skills

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology
B. Shop Operation
C. Employability Skills
D. Leadership Competencies

Missouri Learning Standards
ELA: Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.

Learning Goal	Proficiency Scale
The student will be able to apply the skills needed to work in a shop environment.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Conducting specified searches to locate vehicle and service information. • Completing work order and estimates and communicating results with the customer. • Maintaining a good work ethic (i.e., relations with others, dependability, attitude, and personal hygiene). • Displaying the skills of teamwork, etiquette and courtesy in the shop

	environment. • Applying management skills to maintain order and a good work environment. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: make, manufacture, model, body style, chassis, ethics, responsibility, respect, attitude, teamwork., all data, flat rate, estimate, labor operation, tax rate, mark up, jobber, wholesale, retail, sublet, resume, reference, interview, harassment, prosecution, lawsuit, liability, arrest, citation, driver's license, social security number, suspended, revoke, organization, personal space, shared space, collaborate, requisition, invoice, appearance. • Performing processes such as: o Identifying attitudes and skills that contribute to a positive shop environment. o Identifying possible legal issues that can arise from employment. o Identifying what vehicle and service information needs to be researched. o Identifying make, model, year, and chassis of vehicles needing service. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

The student knows how to:

- Identify make and model of vehicles to facilitate accurate research into needed information.
- Research applicable vehicle and service information.
- Demonstrate a good work ethic (i.e., relations with others, dependability, attitude, and personal hygiene).
- Demonstrate teamwork.
- Demonstrate etiquette and courtesy.
- Develop and maintain a code of professional ethics.
- Demonstrate effective communication skills.
- Complete work and order estimates.
- Demonstrate job-seeking techniques.
- Describe legal issues of sexual harassment in the workplace.
- Identify employment eligibility requirements.
- Perform tasks related to effective personal management skills.
- Demonstrate interpersonal skills.
- Demonstrate effectiveness in oral and written communication.
- Maintain a good professional appearance.
- Perform basic parliamentary procedures in a group meeting.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 3 Steering and Suspension

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology

IV. Steering and Suspension

- G. General suspension and steering systems diagnosis.
- H. Steering systems diagnosis and repair.
- I. Suspension systems diagnosis and repair.
- J. Related suspension and steering service.
- K. Wheel Alignment.
- L. Wheel and tires.

Missouri Learning Standards

ELA: Reading in Science and Technical areas 11-12.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (Finding and using vehicle service records and service manuals and bulletins).

WGSD Curriculum
Industrial Technology Department

Learning Goal	Proficiency Scale
Students will be able to maintain safe operation of automotive steering and suspension systems	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Interpreting necessary information to determine repair actions in suspension and steering systems in accordance with industry standards. • Inspecting, diagnosing, and repairing problems in power steering components and fluids in accordance with industry standards. • Inspecting, diagnosing, and repairing problems in suspension system joints, balls, coil springs, stabilizer bars, bushings and brackets in accordance with industry standards. • Inspecting, diagnosing, and repairing problems in shock absorbers, wheel bearings and other components of suspension and steering mechanisms. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: spring, ball joint, tie-rod, drag (center), link, idler arm, pitman arm, control arm, stabilizer bar, bushing, belt, pump, hose, power steering fluid, shock absorber, McPhearson strut, zerk fitting, part number, interchange, OE, all data, work order, estimate, requisition, VIN, recall, TSB, SRS, air bag, tilt, telescoping, universal joint, "rag" joint, ignition lock cylinder, ignition switch, knuckle, spindle, torsion bar, key, insulator, silencer, sleeve, shackle, wheel bearing, hub assembly, pressure switch. • Performing processes such as: ○ Identifying correct service information and vehicle service bulletins.

	○ Identifying and describing needed repair actions for suspension and steering systems. ○ Performing routine maintenance on automotive steering and suspension systems. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Complete work order to include customer information and vehicle identification information.
- Identify and interpret suspension and steering system concerns; determine necessary action.
- Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins.
- Locate and interpret vehicle and major component identification numbers.
- Disable and enable supplemental restraint system (SRS).
- Diagnose steering column noises.
- Identify power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns.
- Identify power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns.
- Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
- Inspect steering shaft universal joints, flexible couplings, collapsible columns, lock cylinder mechanisms, and steering wheel.
- Inspect mounting bushings and brackets.
- Determine proper power steering fluid type; inspect fluid level and condition.
- Fill power steering system.
- Identify power steering fluid leakage; determine necessary action.
- Remove, inspect, replace, and adjust power steering pump belt.

- Remove and install power steering pump.
- Remove and install power steering pump pulley.
- Check power steering pulley and belt alignment.
- Remove, inspect, and install and replace pitman arm, relay (center link/intermediate) rod, idler arm mountings, and steering linkage damper.
- Remove, inspect, and install upper and/or lower ball joints.
- Remove, inspect, and install steering knuckle assemblies.
- Remove, inspect, and install short and long arm suspension system coil springs.
- Remove, inspect, and install suspension system torsion bars; inspect mounts.
- Remove, inspect, and install stabilizer bar bushings, brackets, and links.
- Remove, inspect, and install strut cartridge or assembly and strut coil spring, insulators (silencers), and upper strut bearing mounts.
- Inspect, remove, and replace shock absorbers.
- Remove, inspect, and service or replace front and rear wheel bearings.
- Lubricate suspension and steering systems.
- Describe the function of the idle speed compensation switch.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 4 Wheels

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
Introduction to Automotive Technology

IV: Steering and Suspension
E. Wheel Alignment Diagnosis, Adjustment, and Repair.
F. Wheel and Tire Diagnosis and Repair.</td></tr>
<tr><td>Learning Goal

Students will be able to maintain safe operation of automotive wheel and tire systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Diagnosing and repairing problems with wheels and tire systems.
• Maintaining tire and wheel systems to meet road safety regulations.
• Inspecting, balancing, repairing and replacing tire and wheel components.
• Inspecting, diagnosing and repairing problems with alignment systems.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: wander, drift, pull, caster, camber, toe, air pressure, normal wear, abnormal wear, torque wrench, wheel fastener, section width, aspect ratio, bead, bead seat, steel belt, ply, valve stem, wheel weight, patch, plug, torque steer, SAI, cradle, subframe, frame., wheel/tire drag, TPMS, core.</td></tr>
</table>

	• Performing processes such as:
	  ○ Describing potential problems with wheels and tires.
	  ○ Checking air pressure.
	  ○ Dismounting and remounting tires, wheel balancing and tire assembly, and reinstalling wheels.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Diagnose vehicle wander, drift, and pull, hard steering, torque steer, and steering return concerns; determine necessary action.
- Preform pre-alignment inspection, and measure vehicle ride height; perform necessary action.
- Check for front wheel setback; determine necessary action.
- Check front and/or rear cradle (subframe) alignment; determine necessary action.
- Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action.
- Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
- Rotate tires according to manufacturer's recommendations.
- Diagnose tire pull problems; determine necessary action.
- Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.
- Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- Reinstall wheel; torque lug nuts.
- Inspect tire and wheel assembly for air loss; perform necessary action.
- Repair tire using internal patch.
- Inspect, diagnose, and calibrate tire pressure monitoring system.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 5 Brakes

High Priority Standards

MoDese Standards for Industrial Automotive Technology
Introduction to Automotive Technology
V. Brakes

A. General brake systems diagnosis and evaluation in accordance with industry standards.
B. Hydraulic system diagnosis and repair.
C. Drum brake system and diagnosis and repair.
D. Disc brake system diagnosis and repair.
F. Miscellaneous diagnosis and repair.
G. Electronic brake and traction control systems.

Missouri Learning Standards
ELA-Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (Interpreting technical documentation related to repairs.)

Learning Goal	**Proficiency Scale**
Students will be able to maintain safe operation of automotive brake systems.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Diagnosing and repairing general brake system concerns. • Locating and interpreting vehicle and major component identification numbers using diagrams, schematics, and online resources.

	• Diagnosing and repairing hydraulic, drum, and disc brake systems problems. • Performing routine and non-routine maintenance all brake systems. • Diagnosing and repairing electronic brake system concerns. Level 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing and recalling specific vocabulary, such as: shimmy, pulsation, grinding, diagram, part number, pads, rotor, caliper, hose, pipe, shoe, drum, wheel cylinder, master cylinder, combination valve, proportioning valve, metering valve, brake fluid, DOT (Department of Transportation), brake cable, bearing, ABS, traction control, vehicle stability control, all data, work orders, estimates, part number, interchange, VIN, TSB, service precaution, free travel, pedal height, bleed, contaminate, compress, pull, drag, tube bender, inverted flare, double flare, ISO AN, brake light switch, pressure switch, flush, drag, pull, grab, vacuum, vacuum booster, hydraulic booster, check valve, earing, race, cone, hub assembly • Performing processes such as: o Identifying brake system concerns. o Locating ID numbers for parts needed. o Describing different types of brakes and brake systems found in automobiles. o Performing routine maintenance on all brake systems. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

The student knows how to:

- Complete work order to include customer information, vehicle identifying information, and customer concerns.
- Identify and interpret brake system concerns and determine necessary action.
- Research applicable vehicle and service information, such as brake system operation, service precautions, and technical service bulletins.
- Locate and interpret vehicle and major component identification numbers to find parts.
- Diagnose pressure concerns in the brake system using hydraulic principles.
- Measure brake pedal height, travel, and free play.
- Check master cylinder for internal/external leaks and proper operation; determine necessary action
- Remove, bench bleed, and reinstall master cylinder
- Diagnose poor stopping, pulling or dragging concerns caused by malfunction in the hydraulic system, determine necessary action.
- Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports, determine necessary action.
- Replace brake lines, hoses, fittings, and supports.
- Fabricate brake lines using proper material and flaring procedures (double flare).
- Select, handle, store, and fill brake fluids to proper level.
- Inspect, test, and/or replce components of brake warning light system.
- Bleed and/or flush brake system.
- Diagnose poor stopping, noise, vibrations, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
- Remove, clean, inspect, and measure brake drums; determine necessary action.
- Refinish brake drum; measure final drum diameter.
- Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, and other related brake hardware, and backing support plates; lubricate and reassemble.
- Inspect and install wheel cylinders.
- Install wheel, torque lug nuts, and make final checks and adjustments.
- Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action.

- Remove caliper assemble; inspect for leaks and damage to caliper housing; determine necessary action.
- Clean and inspect caliper mounting and slide/pins for operation, wear, and damage; determine necessary action.
- Reassemble, lubricate, and install caliper, pads, and related hardware; seat pads, and inspect for leaks.
- Remove and reinstall rotor.
- Refinish rotor off vehicle, measure final rotor thickness.
- Retrace caliper piston on an integrated parking brake system.
- Install wheel, torque lug nuts, and make final checks and adjustments.
- Check vacuum supply to vacuum-type power booster.
- Inspect vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action.
- Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action.
- Measure and adjust master cylinder pushrod length.
- Check brake pad wear indicator system operation; determine necessary action.
- Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings.
- Check parking brake and indicator light system operation.
- Replace wheel bearing and race.
- Inspect and replace wheel studs.
- Remove and reinstall sealed wheel bearing assembly.
- Check operation of brake stop light systems.
- Identify and inspect electronic brake control system components.
- Identify poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with electronic brake control system.
- Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes.
- Bleed the electronic brake control system hydraulic circuits.
- Test, diagnose, and service electronic brake control system speed sensors and toothed ring.
- Diagnose electronic brake control system braking concerns caused by vehicle modifications.
- Identify traction control/vehicle stability control system components.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 6 Charging Systems

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Automotive Technology
VI. Electrical/Electronic Systems

F. General Electrical System Diagnosis.
G. Battery Diagnosis and Service.
H. Starting System Diagnosis and Repair.
I. Charging System Diagnosis and Repair.
J. Lighting System Diagnosis and Repair.
K. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
L. Horn and Wiper/Washer diagnosis and Repair.

Learning Goal	**Proficiency Scale**
Students will be able to maintain safe operation of automotive starting, charging, and warning systems.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Inspecting, diagnosing, repairing, and maintaining all the following automotive systems such as general electrical system components, battery and battery systems, starting systems, charging systems and lighting systems. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: battery, alternator, cable wire, conductor, insulator, belt, volts, fuse, switch, bulb, motor, crimp, heat

	shrink, solder, discharge, acid, short, open, pulley, tensioner, jumper cable, booster pack, cold cranking amps, cranking amps., all data, work order, estimate, TSB, recall, series circuit, parallel circuit, series parallel circuit, diagram, jumper wire, parasitic draw, starter, volt, amp, OHM, relay, solenoid, DVOM, idler, sending unit,MAP, BARO, sea level, atmospheric pressure, OBD, OBDII, scan tool, ALDL, flow chart, ignition module/ignitor, fuel pump, relay, regulator, infector, EVAP • Performing processes such as: o Identifying major components of the systems listed in level 3. o Using meters and circuit testers accurately. o Safely connecting and charging a low battery. o Inspecting and maintain all of the systems listed in level 3. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Learning Targets

The student knows how to:

- Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
- Identify and interpret electrical/electronic systems concern and determine necessary action.
- Research applicable vehicle and service information, such as electrical/electronic system operation, service precautions, and technical service bulletins.
- Locate and interpret vehicle and major component identification numbers.
- Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits.
- Use wiring diagrams during diagnosis of electrical circuit problems.
- Demonstrate proper use of a digital multi-meter (DMM).
- Check electrical circuits with a test light.
- Check electrical circuits using fused jumper wires.
- Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- Measure and diagnose the cause(s) of excessive parasitic draw.
- Inspect and test fusible links, circuit breakers, and fuses.
- Inspect and test wires of electrical/electronic circuits.
- Remove and replace terminal end from connector; replace connectors and terminal ends.
- Repair wiring harness.
- Perform solder repair of electrical wiring.
- Perform battery state-of-charge test and determine necessary action.
- Perform battery capacity test and confirm proper battery capacity for vehicle application.
- Maintain or restore electronic memory functions.
- Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs.
- Perform battery charge.
- Start vehicle using jumper cables or an auxiliary power supply.
- Perform starter current draw tests.

- Perform starter circuit voltage drop tests.
- Inspect and test starter relays and solenoids.
- Remove and install starter in a vehicle.
- Inspect and test switches, connectors, and wires of starter control circuits.
- Perform charging system output test.
- Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
- Remove, inspect, and install generator (alternator).
- Perform charging circuit voltage tests.
- Diagnose the cause of intermittent, dim, or no light operations.
- Inspect, replace, and aim headlights and bulbs.
- Inspect and diagnose incorrect turn signal or hazard light operation.
- Inspect and test gauges and gauge sending units for cause of abnormal gauge readings.
- Inspect and test connectors and wires of gauge circuits.
- Diagnose causes of incorrect operation of warning devices and other driver information systems.
- Inspect and test sensors, connectors, and wires of electronic instrument circuits.
- Diagnose incorrect horn operation.
- Diagnose incorrect wiper operation.
- Diagnose incorrect operation of motor-driven accessory circuits.
- Remove and reinstall door panel.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 7 Engine Performance

High Priority Standards

MoDese Performance Indicators for Automotive Technology
Automotive Technology
VIII. Engine Performance

B. General Engine Diagnosis.
G. Ignition System Diagnosis and Repair
H. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair.
I. Emissions Control Systems and Diagnosis.
J. Engine Related Services.

Learning Goal	Proficiency Scale

Students will understand and be able to maintain safe engine performance and drivability.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	• Interpreting and evaluating problems, and determining actions for these automotive systems:
	  o Computerized engine controls.
	  o Ignition systems.
	  o Fuel, air inductions and exhaust systems.
	  o Emission controls.
	• Applying mechanical skills needed to repair diagnosed problems.

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: drivability, no start, crank, hard start, spark plug, spark plug wire, coil, gasoline, engine oil, thermostat, antifreeze/coolant, radiator, pressure cap, coolant recovery, hose, hose clamp, fuel filter, air filter, oil filter, fuel economy.
	• Performing processes such as:
	  ○ Checking and replacing fuels, lubricants and filters.
	  ○ Changing oil and oil filters.
	  ○ Replacing air filters.
	  ○ Identifying abnormal engine conditions, such as excess noise or exhaust.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Complete work order to include customer information, vehicle identifying information and customer concerns.
- Research applicable vehicle and service information, such as engine management, system operation, vehicle service history, service precautions, and technical service bulletins.
- Identify and interpret engine performance concerns.
- Locate and interpret vehicle and major component identification numbers.
- Inspect engine assembly for fuel, oil, coolant, and other leaks.
- Diagnose abnormal engine noise or vibration concerns.
- Diagnose abnormal exhaust color, odor, and sound.
- Perform engine absolute manifold pressure tests.
- Perform cylinder cranking.

- Perform cylinder leakage tests.
- Identify engine mechanical, electrical, electronic, fuel, and ignition concerns.
- Verify engine operating temperature.
- Check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses.
- Verify correct camshaft timing.
- Retrieve and record diagnostic trouble codes, OBD monitor status, and clear codes when applicable.
- Diagnose the causes of emissions or drivability concerns with stored or active diagnostic trouble codes, obtain and interpret scan tool data.
- Access and use service information to perform step-by-step diagnosis.
- Identify ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability.
- Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s).
- Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s).
- Inspect and test crankshaft and camshaft position sensor (s).
- Inspect, test, and/or replace ignition control module.
- Diagnose hot or cold no=starting, hard-starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems.
- Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.
- Replace fuel filters.
- Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and /or unmetered air.
- Inspect and test fuel injectors.
- Verify idle control operation.
- Inspect air induction system.
- Replace air filter.
- Inspect and replace cabin air filter.
- Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.
- Perform exhaust system back-pressure test.

- Diagnose oil leaks.
- Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses.
- Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system.
- Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses.
- Diagnose emissions and drivability concerns caused by the evaporative emissions control system.
- Inspect and test components and hoses of the evaporative emissions control system.
- Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems.
- Adjust valves on engines with mechanical or hydraulic lifters.
- Remove and replace timing belt; verify correct camshaft timing.
- Remove and replace thermostat and gasket/seal.
- Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices.
- Perform common fastener and thread repairs, to include; remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.
- Perform engine oil and filter change.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Lab
Grade Level: 11-12

LG 1: The curriculum for this course is co-developed with the student and teacher.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 1 Shop Safety

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology:
Introduction to Automotive Technology
1. Basic personal safety
2. 2. Ladder and tool safety
.</td></tr>
<tr><td>Learning Goal

Students will be able to keep themselves safe in a working shop environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Demonstrating safe work habits, handling of hazardous materials, safe use of lifting/hoisting devices, and power and hand tools.
• Complying with all personal and environmental safety regulations that apply to the shop environment.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: combination wrench, screwdriver, pliers, hammer, socket, ratchet, punch, chisel, fire extinguisher (A,B,C,D), drill motor, drill bit, grinder, safety glasses, lift, jack, jack stand, impact wrench, blowgun, solvent, acid, caustic, brake parts cleaner, flammable, earplugs, carbon monoxide, OSHA, vise, micrometer, carburetor cleaner,</td></tr>
</table>

<table>
<tr>
<td></td>
<td>lithium, penetrant, mineral spirits, thinner, reducer, catalyst.
• Performing processes such as:
o Identifying safe ways to use hand and power tools.
o Identifying and describing the situations that call for protective equipment.
o Knowing that regulations from all levels of government exist for shop environments.
o Using personal protective equipment in the shop environment (i.e., clothing and safety glasses).
o Identifying and describing how fire protection equipment is used.
o Identifying chemicals used to clean and maintain automotive parts.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td>
</tr>
<tr>
<td colspan="2">Learning Targets

The student knows how to:
• Demonstrate the safe use of hand tools.
• Demonstrate the safe use of power tools.
• Practice the safe use of personal protective equipment (ie. clothing and safety glasses).
• Describe how to use fire protection equipment safely.
• Demonstrate the safe use of shop equipment.
• Describe how to use chemicals safely.</td>
</tr>
</table>

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 2 Shop Skills

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
3. Lab Procedures
6. Engine/Product Identification

Missouri Learning Standards
ELA: Reading in Science and Technical areas 11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context (service manuals, parts lists, work orders).</td></tr>
<tr><td>Learning Goal

The student will be able to apply the skills needed to work in a shop environment.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Conducting specified searches to locate vehicle and service information.
• Completing work order and estimates and communicating results with the customer.

Level 2: Student demonstrates he/she is nearing proficiency by:
● Recognizing and recalling specific vocabulary, such as: make, manufacture, model, body style, chassis, work order, service manual, serial number, ytpe</td></tr>
</table>

	number, code number, CO, CO2, HC, NOx, parts manual, flywheel brake
	• Performing processes such as:
	  ○ Identifying attitudes and skills that contribute to a positive shop environment.
	  ○ Identifying what vehicle and service information needs to be researched.
	  ○ Identifying make, model, year, and chassis of vehicles needing service.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Identify make and model of vehicles to facilitate accurate research into needed information.
- Research applicable vehicle and service information.
- Develop and maintain a code of professional ethics.
- Demonstrate effective communication skills.
- Complete work and order estimates.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 3 Tools and Fasteners

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MoDese Performance Indicators for Automotive Technology
4. Tools and Equipment
5. Fasteners</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand proper use and identification of tools, equipment, and fasteners.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
Applying proper use and care of all tools used in the auto shop such as hand tools, precision measuring tools, power tools, and diagnostic tools.
Determining torque value and technique for fasteners.
Applying gaskets and sealants as needed for a completed job.
Level 2: Student demonstrates he/she is nearing proficiency by:
Recognizing and recalling specific vocabulary, such as: combination wrench, flare nut wrench, ratchet, socket, extension, universal, screwdrivers, hammers, pliers, torque wrench, snap ring pliers, punches, chisels, pullers, vise, micrometer, dial indictor, bore gauge, telescoping gauge, caliper, square, drill, impact wrench, grinder, tap, die, test light, DVOM, screw, bolt, nut, lock</td></tr>
</table>

	washer, flat washer, fastener grade, pitch, gasket, RTV, thread sealant.
	• Performing processes such as:
	  ○ Identifying all industry related tools and fasteners.
	  ○ Measuring bolts and threads.
	  ○ Identifying gaskets and sealants for various applications.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 4 Four Stroke cycle engines

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
7. Four-stroke Cycle Engines</td></tr>
<tr><td>Learning Goal

Students will understand four-stroke cycle engine theory and construction.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the operating cycle of the four-stroke cycle engine.
• Disassembling and reassembling a four-stroke cycle engine.
•
Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: four-stroke cycle, block, cylinder head, crankshaft, camshaft, connecting rod, piston, piston rings, piston (wrist) pin, lifters, valves, valve springs, valve spring retainer, crankcase cover, oil pump, flywheel, carburetor, muffler, air filter.
• Performing processes such as:
o Inspecting and servicing cylinders, pistons, rings, connecting rods, valve train assemblies, crankshaft assemblies.
o Identifying the difference between L-head and overhead valve trains.
o Testing compression.</td></tr>
</table>

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 5 Trouble Shooting and Failure Analysis

<table>
<tr><td colspan="2">High Priority Standards

MoDese Standards for Industrial Automotive Technology
10. Troubleshooting
23. Failure Analysis</td></tr>
<tr><td>Learning Goal
Students will understand troubleshooting as a systematic approach to identify failures.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Examining the faulty systems and components to determine what repairs are needed.
• Performing specific tests to make an accurate diagnosis.
• Making repairs and retesting to verify repairs.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: service manual, specifications, symptoms, systems, verify complaint, verify repairs, fuel, fuel system, ignition system, lubrications, contamination, spark plug, flywheel key, vacuum, abrasive, overheating, vibration.
• Performing processes such as:
o Identifying the effects of things that can cause engine damage or failure, such as abrasive ingestion, insufficient lubrication, and overheating.
o Identifying engine systems and components.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 6 Fuel systems

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
11. Fuel Systems.
12.Governor System</td></tr>
<tr><td>Learning Goal

Students will understand operational components of carburetor fuel systems.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining all types of fuel system components and their relationship to each other and the rest of the engine.
• Explain the governor system and the purpose of it as part of the engine.
• Testing, repairing/replacing components of the fuel system such as diaphragm-type carburetor, fuel filters and strainers, fuel tank, shut-off valve, fuel lines and hoses, mechanical governor systems and linkages, and float-type carburetor.
Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: carburetor, fuel filter, fuel pump, fuel hose/pipe, fuel tank, air filter, gasoline, octane, diaphragm, gravity, governor, air vane, centrifugal force, RPM, rich fuel mixture, lean fuel mixture, CARB, EPA, idle, cold start, hot start, acceleration, vacuum, Venturi principle, choke, float, primer.</td></tr>
</table>

	• Performing processes such as:
	  o Identifying the types and grades of gasoline used in power equipment.
	  o Servicing air cleaners and fuel filters.
	  o Adjusting engine RPM's.
	  o Disposing of contaminated fuel per EPA regulations.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 7 Electrical Starting and Charging

<table>
<tr><th colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
13. Electrical Systems
14. Ignition Systems</th></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand components and operation of electrical and starting systems.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining basic electrical theory.
• Explaining battery storage theory and operation.
• Explaining different types of circuit failures and how to repair them.
• Interpreting electrical meter readings.
• Testing, repairing, and/or replacing charging and ignitions system components.
• Explaining the theory of operation of the ignitions system.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: conductor, insulator, circuit, volts, ohms, coil, electrode, ignition, battery, transformer, magneto, gap, DVOM, fuse, fusible link, continuity, gauge, switch, alternator, corrosion, resistance, plate, sulfating, sulfuric acid, hydrogen gas, multi-meter, starter,</td></tr>
</table>

	solenoid, flywheel. • Performing processes such as: o Identifying terminals and connectors. o Identifying electrical wire sizes. o Determining battery state of charge. o Removing and servicing spark plugs. o Removing, cleaning, and replacing batteries. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Course: Automotive Technology

WGSD Curriculum
Industrial Technology Department

Grade Level: 11-12
LG 8 Lubrication

<table>
<tr><th colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
15. Lubrication Sytems.</th></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand lubrication systems and service.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the importance of lubrication in automotive systems.
• Troubleshooting lubrication systems and describing needed repairs.

Level 2: Student demonstrates he/she is nearing proficiency by:
● Recognizing and recalling specific vocabulary, such as: friction, lubrication, oil, API, SAE, viscosity, multiviscosity, detergent/disoersants, splash system, pressure system, pump, dipper, oil filter, bypass, babbit, cooling, foam, corrosion, insert, screen, bearing, antifriction bearing, friction bearing, dipstick, sight glass, seal.
• Performing processes such as:
o Identifying common oil contaminants.
o Changing engine oil and filter.
o Selecting the proper oil.
o Servicing the crankcase breather.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

Course: Automotive Technology

WGSD Curriculum
Industrial Technology Department

Grade Level: 11-12
LG 9 Cooling

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
16. Cooling Systems</td></tr>
<tr><td>Learning Goal

Students will understand liquid cooled and air cooled systems used in small engines.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the purpose of a cooling system and the major causes of engine overheating.
• Explaining cooling related service procedures performed on both liquid and air cooled engines.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: conduction, convection, cooling fins, water jacket, antifreeze, pump, thermostat, radiator, tubes, hose neck, petcock, pressure cap, air lock, operating temperature, fan.
• Performing processes such as:
o Identifying the purpose of thermostats, water pumps, and antifreeze.
o Removing and replacing water pump and fan drive belt, thermostat, and radiator.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

Course: Automotive Technology

WGSD Curriculum
Industrial Technology Department

Grade Level: 11-12
LG 10 Exhaust and Emissions

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
9. Emissions
17. Exhaust Systems</td></tr>
<tr><td>Learning Goal

Students will understand the exhaust system and emission controls on automotive engines.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the consequences of noncompliance with emission standards.
• Describing the function of the automotive exhaust system.
• Servicing and/or replacing a four-stroke cycle exhaust system.

Level 2: Student demonstrates he/she is nearing proficiency by:
● Recognizing and recalling specific vocabulary, such as: muffler, decibel, pope, clamp, hangar, isolator, heat shield, spark arrestor, catalytic converter, CO, CO2, HC, NOx, valve guide, piston rings, vacuums, rich, lean, back pressure, overlap, scavange, EPA, CARB.
• Performing processes such as:
o Identifying service cleaning procedures for exhaust ports.
o Identifying types of emissions.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

WGSD Curriculum
Industrial Technology Department

Course: Automotive Technology
Grade Level: 11-12
LG 11 Maintenance

<table>
<tr><td colspan="2">High Priority Standards

MoDese Performance Indicators for Automotive Technology
22.</td></tr>
<tr><td>Learning Goal

Students will be able to perform normal automotive maintenance.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
•
Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: blade, belt, pulley, set screw, air filter, oil, points and condenser, cable/linkages, lubricate, spark plug, fuel filter, air pressure.
• Performing processes such as:

Level 1: Student demonstrates a limited understanding or skill with the learning goal.</td></tr>
</table>

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 1 Safety

High Priority Standards

MoDese Career Profiles: Building Maintenance

1. Orientation to building maintenance.

1.2. Identify safe work site procedures/practices, including fall protection and confined spaces.

1.3. Identify emergency first aid procedures, including MSDS (material safety data sheets).

Learning Goal	**Proficiency Scale**

Students will understand the importance of safety procedures in the construction crafts.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	• Explaining the role of OSHA in job-site safety.
	• Explaining fall protection, and ladder, stair, and scaffold procedures.
	• Explaining the use of hazard communications and material safety data sheets.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: HazCom, MSDS, OSHA.
	• Performing processes such as:
	  ○ Identifying causes of accidents.
	  ○ Demonstrating use and care of personal protective equipment.
	  ○ Identifying struck-by and caught in-between safety hazards.
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 2 Working With Wood

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">MoDese Career Profiles: Carpentry
Building Materials, Fasteners, and Adhesives
2. State the uses of various types of hardwoods and softwoods.
3. Identify the different grades and markings of wood building materials.
6. State the uses of various types of engineered lumber.
7. Calculate the quantities of lumber and wood products using industry-standard methods.
8. Describe the fasteners, anchors, and adhesives used in construction work and explain their uses.</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Student will be able to build with wood.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the use of fasteners, anchors, and adhesives and the best application for each.
• Differentiating grades and types of lumber and best application for each.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: hardwood, softwood, grades, markings, engineered wood.
• Performing processes such as:
o Identifying woods and engineered woods</td></tr>
</table>

	○ Describing best methods of storing and handling building materials Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 3 Framing

<table>
<tr><td colspan="2">High Priority Standards

MoDese Career Profiles: Building Maintenance
Wall and Ceiling Framing
1. Identify the components of a wall and ceiling layout.
2. Describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition T’s, bracing, and firestops.</td></tr>
<tr><td>Learning Goal

Students will be able to build a wall.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Describing how a wood frame wall is constructed including components such as plates, corner posts, door and window openings, bracing, partition T’s, and firestops.
• Laying out and assembling exterior walls for a frame building.
• Explaining the use of metal studs in wall framing.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: plates, corner posts, door and window openings, bracing, partition T, firestop
• Performing processes such as:
o Identifying sheathing materials.</td></tr>
</table>

	○ Identifying fasteners for a variety of materials. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 4 Drywall

<table>
<tr><td colspan="2">High Priority Standards

MoDese Career Profiles: Carpentry
Drywall Installation
1. Identify the different types of drywall and their uses.
2. Select the type and thickness of drywall required for specific installations.
3. Select fasteners for drywall installation.
4. Explain the fastener schedules for different types of drywall installations.
5. Perform single-layer and multi-layer drywall installations using different types of fastening systems, including: • Nails • Drywall screws • Adhesives</td></tr>
<tr><td>Drywall Installation

Student will be able to install and repair walls.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining how to measure, cut, and install drywall on a wood stud frame.
• Applying single layer and multilayer installations for a variety of situations such as wet areas, soundproofing, repairs, and living area walls.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: ¼”, ½”, 5/8”, gypsum, sheetrock, taping, mudding, drywall screw, liquid nails, sound proof, green board, patch.</td></tr>
</table>

	• Performing processes such as:
	  o Identifying the best type of drywall for the job.
	  o Choosing fasteners for the material and application.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level:
LG 5 Roofing

High Priority Standards

MoDese Career Profiles: Carpentry
Roof Framing

1. Understand the terms associated with roof framing.
2. Identify the roof framing members used in gable and hip roofs.
4. Identify the various types of trusses used in roof framing.
5. Use a rafter framing square, speed square, and calculator in laying out a roof.
6. Identify various types of sheathing used in roof construction.

Learning Goal	**Proficiency Scale**

Students will be able to frame and finish a roof.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	• Measuring, cutting and fitting various roof structures including trusses and rafters.
	• Applying cutting and installation techniques to roof flashing and shingles.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: shingles, roll roofing, shakes, tiles, metal roof, membrane, valley, hip, ridge cap.
	• Performing processes such as:
	  ○ Identifying tools and processes used to work on roofs.
	  ○ Describing how to make a roof watertight.

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 6 Hand and Power tools

<table>
<tr><td colspan="2">High Priority Standards

MoDese Career Profiles: Carpentry
Introduction to Hand Tools
1. Recognize and identify some of the basic hand tools and their proper uses in the construction trade.
2. Visually inspect hand tools to determine if they are safe to use.
3. Safely use hand tools.
Introduction to Power Tools
1. Identify power tools commonly used in the construction trades.
2. Use power tools safely.
3. Explain how to maintain power tools properly.</td></tr>
<tr><td>Learning Goal

Student will be able to use and maintain hand and power tools.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining maintenance of hand and power tools to ensure safe operation.
• Applying techniques used in class to authentic repair situations.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: hammer, screwdriver, hand saw, circle saw, drill, drill bits.
• Performing processes such as:</td></tr>
</table>

	○ Choosing the best tool for the job. ○ Identifying basic hand tools and their proper use. ○ Identifying basic power tools and their proper use. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Home Maintenance
Grade Level: 10-12
LG 7 Concrete

<table>
<tr><td colspan="2">High Priority Standards

MoDese Career Profiles: Carpentry
Introduction To Concrete, Reinforcing Materials, And Forms
1. Identify the properties of cement.
2. Describe the composition of concrete
3. Perform volume estimates for concrete quantity requirements.
4. Identify types of concrete reinforcement materials and describe their uses.
5. Identify various types of footings and explain their uses.
6. Identify the parts of various types of forms.
7. Explain the safety procedures associated with the construction and use of concrete forms.
8. Erect, plumb, and brace a simple concrete form with reinforcement.</td></tr>
<tr><td>Learning Goal

Students will be able to construct with concrete.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining the difference between concrete and cement and the best application for each.
• Estimating how much concrete is needed for a project.
• Applying concrete construction skills to an authentic project, such as step repair, sidewalk installation, or basement repairs.</td></tr>
</table>

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: footing, form, concrete, cement, volume, square yard, reinforcement.
	• Performing processes such as:
	  ○ Identifying different forms of concrete and cement.
	  ○ Identifying different types of footings and braces and their uses.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum
Industrial Technology Department

Course: Renewable Energies
Grade Level: 10- 12
LG 1 Thermodynamics

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">NEXT GENERATION NATIONAL SCIENCE STANDARDS
HS-PS3-1
Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
HS-PS3-3.
Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy
HS-PS3-4.
Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>.
Students will be able to apply the Laws of Thermodynamics to building materials.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
Using geographical positioning of structures to make the most of a structure’s south facing wall.
Explaining the factors that affect energy efficiency in homes.
Using different materials to affect a home’s energy performance.
Applying knowledge of energy use and efficiency to real life situations.
Comparing different building materials and techniques to achieve the most efficient structure.</td></tr>
</table>

	Level 2: Student demonstrates he/she is nearing proficiency by:
	• Recognizing and recalling specific vocabulary, such as: energy, energy star, solar mass, energy efficiency, climate, passive solar, r-value, energy transference, shading u-value, BTU, solar gain
	• Performing processes such as:
	  ○ Identifying geographical positions that affect a home's energy use.
	  ○ Identify the factors that affect energy efficiency in homes.
	  ○ Describe the relationship between energy use and real life situations.
	  ○ Compare different building materials and techniques.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Use geographical positioning of structures to make the most of a structure's south facing wall.
- Identify the factors that affect energy efficiency in homes.
- Use different materials to affect a home's energy performance.
- Apply knowledge of energy use and efficiency to real life situations.
- Compare different building materials and techniques to achieve the most efficient structure.

Course: Renewable Energies
Grade Level: 10-12
LG 2 Carbon Footprint

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">NEXT GENERATION NATIONAL SCIENCE STANDARDS

HS-ESS3-4
Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will understand how to recognize and reduce the carbon footprint of manmade structures.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
Monitoring a simulated home’s energy use with mathematical models.
Defining and describing the forms of energy that are used in a home using scientific data.
Explaining the most efficient uses of the energy purchased for a home or structure.
Level 2: Student demonstrates he/she is nearing proficiency by:
Recognizing and recalling specific vocabulary, such as: energy, energy star, BTU, energy conservation, KWh, carbon footprint, fuel, climate, heating/cooling, degree day
Performing processes such as:
Identifying a simulated home’s energy use.
Describing the forms of energy that are used in a home.</td></tr>
</table>

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.
Learning Targets Students know how to: • Monitor home energy use • Define and describe the forms of energy that are used in homes • Get the most efficient use of the energy purchased for the home or structure.	

Course: Renewable Energies
Grade Level: 10-12
LG 3 Energy Choices

<table>
<tr><th colspan="2">High Priority Standards</th></tr>
<tr><td colspan="2">NEXT GENERATION NATIONAL SCIENCE STANDARDS
HS-ESS3-1.
Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity
HS-ESS3-6
Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.</td></tr>
<tr><th>Learning Goal</th><th>Proficiency Scale</th></tr>
<tr><td>Students will be able to make choices about energy use and global climate change supported by scientific data.</td><td>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
Describing and analyzing similarities and differences of energy forms using scientific data.
Explaining contribution to global climate change based on differing energy forms using scientific data.
Defining the influences that energy, science and technology have on our lives.
Level 2: Student demonstrates he/she is nearing proficiency by:
Recognizing and recalling specific vocabulary, such as: peak oil, entropy, ohms, climate change, greenhouse effect, kinetic energy, fossil fuels, amps, potential energy, laws of thermodynamics, volts.</td></tr>
</table>

	• Performing processes such as:
	  ○ Identifying different energy forms.
	  ○ Describing global climate changes based on the relationship between energy use and human activity.
	  ○ Identifying the key issues that are at the forefront of energy use.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Describe similarities and differences of energy forms.
- Know their contribution to global climate change.
- Define the influences that energy, science and technology have on our lives.
- Identify the key issues that are at the forefront of energy use.

Course: Renewable Energies
Grade Level:10-12
LG 4 Solar Energy

<table>
<tr><td colspan="2">High Priority Standards

NEXT GENERATION NATIONAL SCIENCE STANDARDS
HS-PS3-3.
Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy

The National Association of State Directors of Career Technical Education Consortium (NASDCTEc)
GREEN/SUSTAINABILITY STANDARDS ARCHITECTURE & CONSTRUCTION CAREER CLUSTER

6. Understand options to reduce energy loads and use green energy sources for building applications</td></tr>
<tr><td>Learning Goal

Students will understand how to convert the Sun’s energy into electricity.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Explaining different types of solar energy capture.
• Measuring solar energy capture.
• Capturing the energy from the sun, store it, and convert it to power for use in items such as electric cars or solar lighting.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: Entropy, parabolic trough, Solar spectrum, Solar thermal, BTU, Active solar, Solar cell, Photon, Solar gain, Photovoltaic, Multimeter, Inverter</td></tr>
</table>

	• Performing processes such as:
	  ○ Identifying ways to capture energy from the sun.
	  ○ Identifying the factors that enhance or hinder the success in gathering the sun's energy
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Define different types of solar energy capture
- Capture the energy from the sun, store it, and convert it to power an electrically driven item (vehicle)
- Identify the factors that enhance or hinder the success in gathering the sun's energy
- Use appropriate tools to measure solar energy capture.

Course: Renewable Energies
Grade Level: 10-12
LG 5 Wind Energy

High Priority Standards

NEXT GENERATION NATIONAL SCIENCE STANDARDS

HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*

Learning Goal	Proficiency Scale
. Students will understand how to capture the energy from the wind for electricity.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Applying the knowledge of calculating "Swept area" to a wind turbine blade design. • Building and testing the efficiency of wind turbine blades. • Harnessing, storing, and converting the energy created by a wind turbine to power an electrical item. • Measuring the energy collected by a wind turbine. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: wind turbine, Nacelle,

	Yaw, blade, generator, aerodynamic lift, swept area, pitch, anemometer
	• Performing processes such as:
	  ○ Identifying how wind energy can be harnessed, stored, and converted.
	  ○ Identifying areas that would be best to build a wind turbine.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Apply the knowledge of calculating "Swept area" to a wind turbine blade design.
- Build and test the efficiency of wind turbine blades.
- Identify areas that would be best to build a wind turbine.
- Harness, store, and convert the energy created by a wind turbine to power an electrical item.
- Measure the energy collected by a wind turbine.

Course: Renewable Energies
Grade Level: 10-12
LG 6 Hydropower

<table>
<tr><td colspan="2">High Priority Standards

NEXT GENERATION NATIONAL SCIENCE STANDARDS
HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*</td></tr>
<tr><td>Learning Goal

Students will be able to apply knowledge of water energy capture to real life situations.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Using the energy from flowing water to make, store, and use electricity.
• Applying knowledge of water energy capture to real life situations.
• Calculate energy collected from moving water.

Level 2: Student demonstrates he/she is nearing proficiency by:
● Recognizing and recalling specific vocabulary, such as: Head, OTEC, barrage, flow, tidal energy, sluice, hydropower, wave energy, reservoir, topographic map, potential energy, germanium diode, solder.
• Performing processes such as:
o Defining and describing different types of water energy capture.
o Choosing the most appropriate method for collecting energy from</td></tr>
</table>

	moving water. Level 1: Student demonstrates a limited understanding or skill with the learning goal.
Learning Targets Students know how to: ● The student knows how to: ● Define and describe different types of water energy capture ● Apply knowledge of water energy capture to real life situations ● Choose the most appropriate method for collecting energy from moving water. ● Calculate energy collected from moving water	

Course: Renewable Energies
Grade Level:10-12
LG 7 Fuel Cells

<table>
<tr><td colspan="2">High Priority Standards

NEXT GENERATION NATIONAL SCIENCE STANDARDS
HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*

HS-PS4-5. Communicate technical information about how some technological devices use</td></tr>
<tr><td>Learning Goal

Students will be able to build and use fuel cells.</td><td>Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:
• Defining different types of fuel cells by how they work and the fuels that they use.
• Building and using fuels cells in simulated real life situations.
• Comparing different building materials and techniques to achieve the most efficient outcome.
• Choosing the most beneficial fuel cells to use for stationary or transportation applications.

Level 2: Student demonstrates he/she is nearing proficiency by:
• Recognizing and recalling specific vocabulary, such as: P.E.M. fuel cell, reformation, electrolysis, electrolyte, electrolyzer, hydrogen, energy carrier</td></tr>
</table>

	• Performing processes such as:
	  ○ Identifying different types of fuel cells.
	  ○ Comparing and contrasting building materials and techniques.
	
	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Define different types of fuel cells by how they work and the fuels that they use.
- Build and use fuels cells in simulated real life situations.
- Compare different building materials and techniques to achieve the most efficient outcome.
- Choose the most beneficial fuel cells to use for stationary or transportation applications.

Course: Woods and Construction
Grade Level: 9-12
LG 1 Safety

High Priority Standards	
MoDese Performance Indicators for Carpentry **Module 00101-09 – Basic Safety** 1. Identify causes of accidents and the impact of accident costs. 2. Explain the role of OSHA in job-site safety. 3. Explain fall protection, ladder, stair, and scaffold procedures and requirements. 4. Identify struck-by hazards and demonstrate safe working procedures and requirements. 5. Identify caught-in-between hazards and demonstrate safe working procedures and requirements. 6. Define safe work procedures to use around electrical hazards. 7. Demonstrate the use and care of appropriate personal protective equipment (PPE).	
Learning Goal	**Proficiency Scale**
Student will understand personal and workplace safety procedures.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Explaining all possible hazards in the wood shop environment such as caught-between and struck-by hazards, electrical hazards, and ladder/scaffold hazards. • Applying safety procedures at all times.

	Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: turn on and turn off procedures for all machines: uniplane, band saw, drill press, surfacer, belt and disc sander. • Performing processes such as: o Identifying OSHA standards. o Identifying correct protective gear for the job. o Identifying the causes of common accidents. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Recognize first aide when it is needed.
- Demonstrate appropriate lab safety practices.
- Communicate safe lab practices.
- Comprehend safe practices for machine operation.
- Comprehend table saw safety.

Course: Woods and Construction
Grade Level: 9-12
LG 2 Measurement

High Priority Standards

MoDese Performance Indicators for Carpentry
Introduction to Construction Math

1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.
2. Use a standard ruler, a metric ruler, and a measuring tape to measure.
3. Add, subtract, multiply, and divide fractions.
4. Add, subtract, multiply, and divide decimals, with and without a calculator.
5. Convert decimals to percentages and percentages to decimals.
6. Convert fractions to decimals and decimals to fractions.
7. Explain what the metric system is and how it is important in the construction trade.
8. Recognize and use metric units of length, weight, volume, and temperature.
9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.

Learning Goal	Proficiency Scale
Student will be able to use tools in order to be precise.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Reading and interpreting results using all forms of measurement tools for carpentry. • Performing calculations for wood cuts and dimensions. • Utilizing layout tools to complete a project.

	Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: Metric vs. standard, numerator, denominator, whole number, reduced, common denominator, try square, carpenters' square, combination square, trim gauge, compass, caliper, & divider, Soft wood, Hardwood, Indigenous wood. • Performing processes such as: o Identifying measurement tools and performing simple calculations. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Read and interpret a rule/tape measure.
- Perform basic math skills (add, subtract, multiply, fractions).
- Identify and use measuring layout tools.
- Identify and properly use hand tools.
- Identify wood species.

Course: Woods and Construction
Grade Level: 9-12
LG 3 Power Tools and Equipment

High Priority Standards

MoDese Performance Indicators for Carpentry
Introduction to Power Tools

1. Identify power tools commonly used in the construction trades.
2. Use power tools safely.
3. Explain how to maintain power tools properly.

Hand and Power Tools

3. State the general safety rules for operating all power tools, regardless of type.
4. State the general rules for properly maintaining all power tools, regardless of type.

Learning Goal	Proficiency Scale
Students will be able to use power tools and equipment consistent with industry and safety standards.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Operating tools within industry standard guidelines for safety. • Performing maintenance of tools to keep them in safe, working order. • Applying a working knowledge of various cuts, joints, and functions of all tools.

	Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: pneumatic tool, grinders, roto zips, uniplane: infeed fence, outfeed fence, table, cutter head, guard, depth gauge, bandsaw: relief cuts, resaw cut, cross cut, rip cut, drill press: chuck, chuck key, table, drill stop, disc sander: size, widest boards, surfacer: turn on procedures, clutch, handle, tablesaw: resaw cut, dado blades, dado cut, rabbit cut, cross cut, rip cut, radial arm saw, cross cut jointer: • Performing processes such as: o Identifying industry standards for use and safety of power tools. o Identifying various cuts and their best use for projects. **Level 1**: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Demonstrate proper use of pneumatic tools.
- Demonstrate proper use of portable electric tools (biscuit joiner, electric drill, router, sander).
- Operate saws accurately (table saw, miter saw, radial arm saw, band saw).
- Operate drill press accurately.
- Operate joiner accurately.
- Operate a bench grinder accurately.
- Operate a planer accurately.
- Operate sanding machines accurately.

Course: Woods and Construction
Grade Level: 9-12
LG 4 Equipment setup

High Priority Standards	
MoDese Performance Indicators for Carpentry **Module 27103-06 – Hand and Power Tools** **6. Use portable power tools in a safe and appropriate manner.**	
Learning Goal	**Proficiency Scale**

Students will be able to set up machine equipment consistent with industry and safety standards.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.
	
	Level 3: Student demonstrates mastery with the learning goal as evidenced by:
	● Applying a complete tool set-up of the following tools to eliminate run-out (tapering or uneven work) or error during machine operation.
	  ● Saws: table, miter, radial arm, band.
	  ● Drill presses, joiners, and planers.
	  ● Sanding machines: wide belt, belt, disc.
	  ● Shaper and router table.
	
	Level 2: Student demonstrates he/she is nearing proficiency by:
	● Recognizing and recalling specific vocabulary, such as: table saw, miter

	gauge, cross cut sled, dubby, resaw cut, rip cut, drill stop, chuck, chuck key, keyless chuck, table, column, duration, safe side, band saw, scroll saw, drill press, disc/belt sander, boss sander, jointer, surfacer, router table, hand tools, hand-held power tools, turn-on procedure, turn-off procedure. • Performing processes such as: o Identifying set up procedures that produce some tapering or uneven work. o Partially checking the settings before operation. o Identifying tools used to saw, drill, sand, and shape. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Set up saws accurately (table, miter, radial arm, band).
- Set up drill presses, joiners, and planers accurately.
- Set up sanding machines accurately (wide belt, belt, disc).
- Set up shaper and router table accurately.

Course: Woods and Construction
Grade Level: 9-12
LG 5 Joinery

High Priority Standards	
MoDese Performance Indicators for Carpentry **Module 27103-06 – Hand and Power Tools** **6. Use portable power tools in a safe and appropriate manner.** **Module 27102-06 – Building Materials, Fasteners, and Adhesives** 1. Identify various types of building materials and their uses. 2. State the uses of various types of hardwoods and softwoods. 3. Identify the different grades and markings of wood building materials.	
Learning Goal	**Proficiency Scale**
Students will be able to use complex joints to construct projects.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: ● Creating joints that are perpendicular, true, and square throughput the project. ● Creating hidden pocket screws and biscuits, and a true and square butt, dado and spline. Level 2: Student demonstrates he/she is nearing proficiency by:

	• Recognizing and recalling specific vocabulary, such as: joints: lap,spine,butt dado rabbet, miter, biscuit, dowels; Finishes: Alkyd based, polyurethene, deft, acrylic based, water based; Fasteners: counter-bore, counter-sink, finish nail, common nails, screws. • Performing processes such as: o Installing dowels and finish screws. o Identifying and choosing types of joints for a project. Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

The student knows how to:

- Identify types of joints used in cabinet making.
- Layout, cut, and construct joints used in cabinet making (lap, pocket screw, spline, butt, dado, rabbet, miter, biscuit).
- Install dowels in common wood joints.
- Select and use fasteners when constructing joints (glue, finish nails, and screws).

Course: Advanced Class- Woods and Construction

Grade Level: 11-12
LG 6 Independent Project

High Priority Standards

International Technology Education Association http://www.iteaconnect.org/TAA/PDsF/xstnd.pdf
Standards for Technological Literacy : Understanding of Design
Standard 8. Students will develop an understanding of the attributes of design.
Standard 9. Students will develop an understanding of engineering design.
Standard 10. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Standards for Technological Literacy : Abilities for a Technological World
Standard 11. Students will develop abilities to apply the design process.

Learning Goal	Proficiency Scale
Students will be able to design and solve a problem.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: • Designing a construction problem by themselves or with others. • Applying problem-solving and wood construction skills to solve a design problem. Level 2: Student demonstrates he/she is nearing proficiency by: • Recognizing and recalling specific vocabulary, such as: elevation, sketch, plot plan, profile view, plan view, model, presentation, master parameters, materials, structure. • Performing processes such as: o Creating a solution to a design problem.

	Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Brainstorm and record solutions.
- Share, discuss and choose the best solution.
- Complete development work.
- Build a prototype.
- Test and redesign.