south dakota DEPARTMENT OF EDUCATION
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CTE Standards Unpacking
Ag Systems Technology

Course: Ag Systems Technology
Course Description: Technically trained employees are needed in many aspects of the agriculture power industry. This course addresses the technical and industrial skills and techniques related to Power, Structural, & Technical Systems within South Dakota, as well as address soft skills needed for careers in this area. Technology in agriculture is ever-changing and this course will address emerging technologies in our industry. Classroom and laboratory content may be enhanced by utilizing appropriate equipment and technology. Mathematics, science, English and human relations skills will be reinforced throughout the course. Work-based learning strategies appropriate for this course are school-based enterprises and field trips. Opportunities for application of clinical and leadership skills are provided by participation in FFA activities, conference and skills competition such as the Ag Mechanics Career Development Event or related proficiency award areas. Each student will be expected to maintain a Supervised Agricultural Experience (SAE) program.
Career Cluster: Agriculture, Food and Natural Resources
Prerequisites: Fundamental Ag Mechanical Technologies, Recommended: Introduction to AFNR
Program of Study Application: Ag Systems Technology is a second pathway course in the Agriculture, Food and Natural Resources Program of Study, Power Systems pathway. Ag Systems Technology is preceded by Fundamental Ag Mechanical Technologies and would be followed by a capstone experience.

<table>
<tr><td colspan="3">INDICATOR #AST 1: Apply engineering principles to mechanical equipment, power utilization and technology.</td></tr>
<tr><td colspan="3">SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept): Compare power generation from various energy sources.</td></tr>
<tr><td colspan="3">SUB-INDICATOR 1.2 (Webb Level: 2 Skill/Concept): Investigate various properties of lubricants needed in ag mechanics.</td></tr>
<tr><td>Knowledge (Factual):
-Classify petroleum sources used in vehicles

-Discuss alternative fuel sources (wind, hydro, solar, etc.)

-Classify lubricants and determine applications for vehicles and machinery
-Classify and describe</td><td>Understand (Conceptual):
-Understand the basic engineering principles behind mechanical equipment, power utilization, and technology</td><td>Do (Application):
-Compare environmental impact of energy sources for pollution

-Compare efficiency or energy source of MPG

-Collect energy from model wind towers

-Compare and contrast alternative energy</td></tr>
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different types of bearings		sources -Demonstrate viscosity and strengths of lubricants -Demonstrate properties of lubricants

Benchmarks:
Students will be assessed on their ability to:

- Research alternative energy sources.
- Research and present on different lubricants and their uses.
- Construct a wind turbine.
- Compete in the Power, Structure, and Technical Systems Agriscience division.
- Compete in the Agriculture Mechanics Career Development Event.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
Math: HSS.IC.B.6 - Evaluate reports based on data. English: 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.	-Evaluate a report comparing efficiency of an energy source to make fuel decisions. -Research and report on alternative energy sources.

INDICATOR #AST 2: **Apply principles of operation and maintenance to mechanical equipment, power utilization, and technology.**

SUB-INDICATOR 2.1 (Webb Level: 2 Skill/Concept): Explain the importance of scheduled service routines to maintain machinery and equipment.

SUB-INDICATOR 2.2 (Webb Level: 2 Skill/Concept): Demonstrate suggested inspections on machinery and/or equipment.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-Read and interpret	-Understand the importance	-Lubricate machinery

operating manuals -Identify regulations of operating machinery and equipment on public roads -Discuss how Child Labor Laws apply to the agriculture industry -Explain the importance of safety guards	of scheduled service routines to maintain machinery and equipment	and equipment to specifications -Service electrical systems -Maintain proper fluid levels -Change oil -Perform troubleshooting -Change, repair and rotate tires -Illustrate applicable laws for on and off highway operation -Perform appropriate start up procedures -Demonstrate safety precautions for power take-off

Benchmarks:
Students will be assessed on their ability to:

- Compete in Agriculture Mechanics Career Development Event.
- Complete Briggs and Stratton Certification.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
Math: HSN.Q.A.3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	-Determine measurements when performing maintenance. (ex. Check air pressure in tire, tolerance levels of valves, etc.).

INDICATOR #AST 3: **Examine principles of service and repair to mechanical and electrical equipment, power utilizations and technology.**

SUB-INDICATOR 3.1 (Webb Level: 3 Strategic Thinking): Evaluate internal combustion engines to assess needed service and repair.		
SUB-INDICATOR 3.2 (Webb Level: 3 Strategic Thinking): Investigate service and repair specifications for operating systems.		
SUB-INDICATOR 3.3 (Webb Level: 4 Extended Thinking): Diagnose problems associated with operating systems.		
SUB-INDICATOR 3.4 (Webb Level: 2 Skill/Concept): Explore electric motor types, operation and maintenance.		
Knowledge (Factual): -Read and interpret operating manuals -Identify the components and functions of a small gas engine -Describe the systems of an engine. (ex. Fuel system, ignition system, etc.) -Describe the different cycles of an engine. (Ex. Two-Cycle, Four-Cycle, etc.) -Identify the different types of electrical motors. (ex. Single phase, triple phase, etc.)	**Understand (Conceptual):** -Understand how to diagnose problems associated with operating systems	**Do (Application):** -Demonstrate safety procedures -Disassemble and reassemble an engine and label parts -Perform troubleshooting -Disassemble and reassemble motors to identify parts -Troubleshoot various operating systems (hydraulic, electrical, heating and cooling, steering, suspension, timing, autosteer, etc.) -Compare and contrast AC and DC electric motors -Service and repair various operating systems (hydraulic, electrical, heating and cooling, steering, suspension, timing, autosteer, etc.)
Benchmarks: *Students will be assessed on their ability to:*		

- Explain the intake and exhaust systems.
- Tour a mechanics shop.
- Compete in Agriculture Mechanics Career Development Event.
- Complete Briggs and Stratton Certification.
- Complete a Power, Structural, and Technology Agriscience Project.

Academic Connections	
ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard): English: 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.	**Sample Performance Task Aligned to the Academic Standard(s):** -Write a reflection paper after touring the mechanics shop. -Write an abstract on a completed Power, Structural, and Technical Systems Agriscience project.

INDICATOR #AST 4: **Analyze emerging agriculture technologies.**

SUB-INDICATOR 4.1 (Webb Level: 2 Skill/Concept): Analyze how emerging agriculture technologies have affected AFNR industries.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-Emerging technologies (ex. comparing robotic vs. manual labor) -Describe the emerging technologies within each career pathways (ex. robotic milkers, weather tracking, satellite images, etc.)	-Understand how emerging agriculture technologies have affected AFNR industries	-Utilize Global Positioning System (GPS) -Utilize Geographic Information System (GIS) -Compare and contrast robotic versus manual labor -Use drones for field mapping -Investigate equipment sensors -Tour an implement dealership to learn about autosteer

Benchmarks:
Students will be assessed on their ability to:

- Create a timeline of technology advances in agriculture.
- Compete in the Agriculture Mechanics Career Development.
- Geocaching activity.
- Take an image of a certain location with a drone and evaluate the area.
- Track weather patterns and record in online programs.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
English: 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.	-Create a timeline of technology advances in agriculture.

INDICATOR #AST 5: **Develop employability skills related to the Power, Structural, and Technical Systems Pathway.**

SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): Develop soft skills to enhance employability.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-Identify power, structural and technical system related careers -Recognize non-verbal communication signals -Identify ways to handle conflict	-Understand power, structural, and technical system career pathways -Understand power, structural, and technical system career educational requirements	-Demonstrate proper communication skills -Compose a cover letter, resume, and follow-up letter -Fill out a job application -Complete a job interview

Benchmarks:
Students will be assessed on their ability to:

- Create an SAE project.
- Work as a team to solve problems.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social	**Sample Performance Task Aligned to the Academic Standard(s):**

Studies Standard): English: 1) 9-12 SL.1 - Participate in collaborative discussion 2) 9-12 W.2 – Write to inform	 -Complete a job interview with local business representatives. -Compose a cover letter, resume, and follow-up letter.

Additional Resources

Briggs and Stratton My Power Portal
Curriculum for Agricultural Science Education Agriculture Power and Technology Curriculum
South Dakota Wind Energy Association-Education and Training tab
WindWise Education: Wind Energy Activities for Students book
Ag Mechanics CDE
Ag Mechanics Design and Fabrication E/P
Ag Mechanics Repair and Maintenance E/P