TN Department of Education | College, Career and Technical Education

Agricultural Power and Equipment

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5945
Prerequisite(s):	*Principles of Agricultural Mechanics* (5944)
Credit:	1
Grade Level:	11
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture, Food, & Natural Resources courses.
Programs of Study and Sequence:	This is the third course in the *Agricultural Engineering and Applied Technologies* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, (615) 477-1857 Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669 Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, Teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	OSHA 30-Hour General Industry Briggs & Stratton Basic Small Engine Certification
Dual Credit or Dual Enrollment Opportunities:	There are dual credit/dual enrollment opportunities for this course at specific colleges. Reach out to a local postsecondary institution(s) for more information.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Course Description

Agricultural Power and Equipment is an applied course in agricultural engineering with special emphasis on laboratory activities involving small engines, tractors, and agricultural equipment. The standards in this course address navigation, maintenance, repair, and overhaul of electrical motors, hydraulic systems, and fuel-powered engines as well as exploration of a wide range of careers in

agricultural mechanics. Upon completion of this course, proficient students will be able to pursue advanced training in agricultural engineering and related fields at a postsecondary institution.

Program of Study Application

This is the third course in the *Agricultural Engineering and Applied Technologies* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food and Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

Occupational Awareness & Safety

1) Consult industry manuals to ascertain the specific safety prevention and control standards governing the agricultural engineering industry. Demonstrate adherence to recognized standards, and apply occupational safety concepts across all coursework, such as but not limited to procedures surrounding general safety, personal safety (such as the use of personal protective equipment), lifting, transporting, alerting, and reporting.

2) Review common laboratory safety procedures for tool and equipment operation in the agricultural power and equipment laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.

3) Use local news media, organizational websites, and real-time labor market information to investigate occupations in agricultural power and equipment. Compare and contrast the knowledge, skills, and abilities necessary for employment, as well as the typical level of education required.

Career Awareness

4) Gather and analyze information from multiple authoritative sources such as the United States Bureau of Labor Statistics (BLS) to develop a written projection of the occupational trends related to agriculture power and equipment. Supplement the narrative with relevant and properly cited charts, graphs, and other visual representations.

5) Investigate opportunities to expand and diversify a Supervised Agricultural Experience (SAE) program as related to agriculture power and equipment. Accurately maintain an activity recordkeeping system and apply proper financial recordkeeping skills to summarize records by completing SAE related applications and reports.

Engine and Motor Mechanics

6) Compare and contrast the first and second laws of thermodynamics as applied to the study of combustion engines. Analyze the theory of operation and efficiency of internal combustion engines with regard to fuels, engine displacement, ignition, lubrication, and cooling.

7) Evaluate and optimize engine performance under load and no-load operation, considering the effects of air temperature, humidity, fuel quality, and engine tuning.
8) Citing technical data and documentation of prior work, develop a written recommendation outlining a specific task or procedure for a given engine or motor (such as using a three-phase 5 hp electric motor in order to drive a 125-foot conveyor belt for lifting grain to a 60-foot silo).

9) Demonstrate the ability to troubleshoot single-cylinder engines and electric motors. Create a written estimate of repairs, including parts, labor, time, and total cost.

Agriculture Machinery

10) Recommend the appropriate machinery for a given agricultural application by matching the mechanical need to the scale and magnitude of the specific task. Using clear and coherent writing, justify the recommendation based on availability of parts, operational costs, maintenance, safety, and total cost. For example, recommend the appropriate tractor for a specified task based on power ratings, engine and transmission systems, hydraulic capabilities, hitching, and ballasting.

11) Research the basic types of fuel and lubricants; differentiate their chief components, characteristics and applications as related to agricultural equipment in an explanatory essay.

12) Demonstrate the ability to maintain, troubleshoot, and repair agricultural equipment and create a written estimate of repairs including itemization of parts, labor, time, and total cost.

13) Compose an informational text comparing and contrasting the types and functions of precision and advanced technologies (such as geographic information systems [GIS], global positioning systems [GPS], and unmanned aerial vehicles [UAV]) available to the agriculture industry, citing technical data where appropriate.

14) Demonstrate in a live setting or in a presentation the ability to safely operate agriculture equipment, including precision-operated equipment if available.

Hydraulics

15) Write an explanatory text to summarize the components and operational theory of a basic hydraulic system used in an agriculture setting.

16) Design a hydraulic system to perform a specific task, applying the principles of fluid kinematics and hydrostatics to outline how the system functions. The design should include specifications for pumps, pipes, and flow rates.

17) Troubleshoot and repair hydraulic power and control systems used in agricultural equipment such as piston-driven lifts and compression devices (such as shears, crushers).

Document the parts and labor involved and draft a repair bill for suitable compensation.

Navigation and Surveying

18) Explain how agricultural enterprises employ geographic information systems (GIS) and global positioning systems (GPS) in their work, including GIS software, GPS receivers, data acquisition, and spatial analysis of data. Debate the legal, ethical, and economic implications of the use of these emerging technologies with regard to maximizing the efficiency and efficacy of agricultural processes, citing specific textual evidence from case studies and news media.

19) Correctly and safely use precision surveying instruments to make measurements of large acreages. Compile a written survey report for use by a lay reader, supplementing the narrative with charts, graphs, and other visual representations to aid comprehension.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards. Students engaged in activities outlined above should be able to demonstrate fluency in Standards in CS, PST, ABS, NRS, PS, and ESS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.