# Scope & Sequence

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| Course Name: Agricultural Power Systems **TSDS PEIMS Code:** 13002400 | | | **Course Credit:** 2.0  **Course Requirements:** Recommended for Grades 10-12.  **Prerequisites:** None.  **Recommended Prerequisites:** Principles of Agriculture, Food, and Natural Resources. |
| **Course Description:** Agricultural Power Systems is designed to develop an understanding of power and control systems as related to energy sources, small and large power systems, and agricultural machinery. To prepare for careers in agricultural power, structural, and technical systems, students must attain academic skills and knowledge; acquire technical knowledge and skills related to power, structural, and technical agricultural systems and the workplace; and develop knowledge and skills regarding career opportunities, entry requirements, industry certifications, and industry expectations. | | | |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. | | | |
| **Total Number of Periods**  **Total Number of Minutes**  **Total Number of Hours** | 350 Periods  15,750 Minutes  262.50 Hours\* | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. | |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***  (assumes 45-minute periods)  Total minutes per unit | **TEKS Covered**  **130.29. (c) Knowledge and skills** | |
| **Unit 1: Professional Standards/Employability Skills**  Students will discuss the professional standards and employability skills, including identifying career development and entrepreneurship opportunities in the field of power, structural, and technical systems, apply competencies related to resources, information, interpersonal skills, problem solving and critical thinking in power, structural, and technical systems, and examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements. Students will further develop and demonstrate these skills and attributes throughout the course. In small groups and/or in other classroom activities, students will demonstrate knowledge of personal and occupational health and safety in the workplace, identify appropriate work habits, and characteristics of good citizenship skills. | 20 periods  900 minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) identify career development and entrepreneurship opportunities in the field of power, structural, and technical systems;  (B) apply competencies related to resources, information, interpersonal skills, problem solving, and critical thinking in power, structural, and technical systems;  (C) examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements;  (D) demonstrate knowledge of personal and occupational health and safety practices in the workplace;  (E) identify employers' expectations and appropriate work habits; and  (F) demonstrate characteristics of good citizenship, including advocacy, stewardship, and community leadership. | |
| **Unit 2: Power Generation to Differing Energy Sources**  Students will discuss power generation to differing energy sources. In small groups and/or in other classroom activities, students will examine benefits and detriments of petroleum and alternative energy sources, compare environmental impacts of varying energy sources, compare efficiency and characteristics of different energy sources, and investigate the efficiency of power generation systems that use various energy sources. | 25 periods  1,125 minutes | (3) The student connects power generation to differing energy sources. The student is expected to:  (A) examine benefits and detriments of petroleum and alternative energy sources;  (B) compare environmental impacts of varying energy sources;  (C) compare efficiency and characteristics of different energy sources; and  (D) investigate the efficiency of power generation systems that use various energy sources. | |
| **Unit 3: Tools for Power Systems**  Students will discuss the appropriate tool to perform a given task related to agricultural power systems. In small groups and/or in other classroom activities, students will  select and identify standard tools, equipment, and safety procedures common to power and control applications, follow operating instructions of specialized tools and equipment such as micrometers, digital multimeters, and dynamometers, set up and adjust tools and equipment such as dynamometers, flow meters, torque wrenches, lathes, and mills, maintain and store tools and equipment common to power and control applications, and inventory tools and equipment in a service or maintenance facility. | 20 periods  900 minutes | (4) The student selects the appropriate tool to perform a given task related to agricultural power systems. The student is expected to:  (A) select and identify standard tools, equipment, and safety procedures common to power and control applications;  (B) follow operating instructions of specialized tools and equipment such as micrometers, digital multimeters, and dynamometers;  (C) set up and adjust tools and equipment such as dynamometers, flow meters, torque wrenches, lathes, and mills;  (D) maintain and store tools and equipment common to power and control applications; and  (E) inventory tools and equipment in a service or maintenance facility. | |
| **Unit 4: Electrical Systems**  Students will discuss electrical systems as related to agricultural machines and equipment. In small groups and/or in other classroom activities, students will collect data and troubleshoot electrical systems using various meters and test equipment such as digital multimeters, employ appropriate techniques for applying devices, controls, and grounding in electrical systems, apply local and national codes and regulations relevant in electrical systems, select and apply electric controls such as motor controls, switches, circuit breakers, timers, sensors, and relays, and interpret data generated by electrical monitoring systems. | 30 periods  1,350 minutes | (8) The student monitors and controls electrical systems as related to agricultural machines and equipment. The student is expected to:  (A) collect data and troubleshoot electrical systems using various meters and test equipment such as digital multimeters;  (B) employ appropriate techniques for applying devices, controls, and grounding in electrical systems;  (C) apply local and national codes and regulations relevant in electrical systems;  (D) select and apply electric controls such as motor controls, switches, circuit breakers, timers, sensors, and relays; and  (E) interpret data generated by electrical monitoring systems. | |
| **Unit 5: Control Systems**  Students will discuss control systems related to agricultural machines and equipment. In small groups and/or in other classroom activities, students will analyze schematic drawings for electrical control systems, describe uses of various electrical control system components, install control system components such as motor controls, switches, circuit breakers, timers, sensors, and relays and properly use appropriate tools, procedures, and safety practices, and identify system performance problems and apply troubleshooting techniques using monitoring or troubleshooting devices. Students will also explain the application of pneumatic systems and controls, and explain the application of water or other fluid control systems to agricultural machines and equipment and their components. | 30 periods  1,350 minutes | (9) The student implements control systems related to agricultural machines and equipment. The student is expected to:  (A) analyze schematic drawings for electrical control systems;  (B) describe uses of various electrical control system components;  (C) install control system components such as motor controls, switches, circuit breakers, timers, sensors, and relays and properly use appropriate tools, procedures, and safety practices; and  (D) identify system performance problems and apply troubleshooting techniques using monitoring or troubleshooting devices.  (11) The student describes additional control systems as related to agricultural machines and equipment. The student is expected to:  (A) explain the application of pneumatic systems and controls; and  (B) explain the application of water or other fluid control systems to agricultural machines and equipment and their components. | |
| **Unit 6: Hydraulic Controls and Applications**  Students will discuss hydraulic controls and applications as related to agricultural machines and equipment. In small groups and/or in other classroom activities, students will describe the operation of open and closed center hydraulic systems, explain the purpose and function of hydraulic controls such as valves, motors, pumps, cylinders, manifolds, and meters, and create basic hydraulic circuits using a variety of hydraulic controls. | 30 periods  1,350 minutes | (10) The student describes hydraulic controls and applications as related to agricultural machines and equipment. The student is expected to:  (A) describe the operation of open and closed center hydraulic systems;  (B) explain the purpose and function of hydraulic controls such as valves, motors, pumps, cylinders, manifolds, and meters; and  (C) create basic hydraulic circuits using a variety of hydraulic controls. | |
| **Unit 7: Small Engines**  Students will discuss the selection, operation, and maintenance of small engines. In small groups and/or in other classroom activities, students will describe principles of operation of internal combustion engines, disassemble and reassemble small engines, select, maintain, and troubleshoot small engines, and research small engine industry certifications. | 40 periods  1,800 minutes | (5) The student selects, operates, and maintains small engines. The student is expected to:  (A) describe principles of operation of internal combustion engines;  (B) disassemble and reassemble small engines;  (C) select, maintain, and troubleshoot small engines; and  (D) research small engine industry certifications. | |
| **Unit 8: Machines and Equipment**  Students will discuss the selection, operation, and maintenance of agricultural machines and equipment. In small groups and/or in other classroom activities, students will identify and select agricultural equipment for appropriate tasks such as the selection of tillage equipment to obtain a desired result, identify and maintain component materials such as bearings, hydraulic cylinders, seals, chains, and drives on varying types of machines and equipment. Students will ensure the presence and function of safety devices such as guards and shields and hardware on machinery and equipment, calibrate metering, monitoring, and sensing equipment on various equipment such as tillage, harvest, transport, and haying equipment, and perform pre-operation inspection and appropriate start-up procedures, identify causes of equipment malfunctions and failures, perform scheduled preventive maintenance, and safely operate equipment. | 60 periods  2,700 minutes | (6) The student selects, operates, and maintains agricultural machines and equipment. The student is expected to:  (A) identify and select agricultural equipment for appropriate tasks such as the selection of tillage equipment to obtain a desired result;  (B) identify and maintain component materials such as bearings, hydraulic cylinders, seals, chains, and drives on varying types of machines and equipment;  (C) ensure the presence and function of safety devices such as guards and shields and hardware on machinery and equipment;  (D) calibrate metering, monitoring, and sensing equipment on various equipment such as tillage, harvest, transport, and haying equipment; and  (E) perform pre-operation inspection and appropriate start-up procedures, identify causes of equipment malfunctions and failures, perform scheduled preventive maintenance, and safely operate equipment. | |
| **Unit 9: Tractors and Power Systems**  Students will discuss selection, operation, and maintenance of tractors and agricultural power systems. In small groups and/or in other classroom activities, students will select tractors based upon application and power requirements and describe or perform safe operation of tractors in various applications, maintain intake and exhaust system components, including shrouds, screens, filters, piping, after-coolers, air induction systems, manifolds, exhaust scrubbers, and mufflers, select lubricants and apply appropriate lubrication as required by maintenance schedules, identify and maintain various fuel systems, power trains, and hydraulic systems used on farm tractors, explain charging, starting, operating, and igniting direct current electrical systems, maintain steering and braking systems. Students will maintain tires and tracks and describe the role of ballasting and traction in farm tractors, and explain the operation of and maintain liquid- and air-cooling systems in tractors. | 60 periods  2,700 minutes | (7) The student selects, operates, and maintains tractors and agricultural power systems. The student is expected to:  (A) select tractors based upon application and power requirements and describe or perform safe operation of tractors in various applications;  (B) maintain intake and exhaust system components, including shrouds, screens, filters, piping, after-coolers, air induction systems, manifolds, exhaust scrubbers, and mufflers;  (C) select lubricants and apply appropriate lubrication as required by maintenance schedules;  (D) identify and maintain various fuel systems, power trains, and hydraulic systems used on farm tractors;  (E) explain charging, starting, operating, and igniting direct current electrical systems;  (F) maintain steering and braking systems;  (G) maintain tires and tracks and describe the role of ballasting and traction in farm tractors; and  (H) explain the operation of and maintain liquid- and air-cooling systems in tractors. | |
| **Unit 10: Supervised Agriculture Experience Program**  Students will discuss and develop all components of a supervised agriculture experience. Through a variety of classroom activities, students will utilize appropriate technology to plan, propose, conduct, document and evaluate their supervised agriculture experience program, apply appropriate record-keeping skills, and participate in leadership opportunities. As a culminating unit activity, students will produce and participate in a local program of activities using a strategic planning process. | 35 periods  1,575 minutes | (2) The student develops a supervised agriculture experience program. The student is expected to:  (A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;  (B) apply proper record-keeping skills as they relate to the supervised agriculture experience;  (C) participate in youth leadership opportunities to create a well-rounded experience program; and  (D) produce and participate in a local program of activities using a strategic planning process. | |