# Advanced Agricultural Power Course No. 18411 Credit: 1.0

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| --- | --- | --- | --- |
| **Student name:** |  | **Graduation Date:** |  |

Pathways and CIP Codes: **Agricultural Technology and Mechanical Systems (01.0201)**

Course Description: Courses enable students to understand the principles underlying various kinds of mechanics (aircraft, auto, diesel, & marine) and how energy is converted, transmitted, & controlled. Topics typically include maintaining & servicing machines, engines & devices while emphasizing energy sources, electricity, and power transmission. The courses may also provide information on career opportunities within the field of mechanics and/or transportation.

Special Note: The AFNR College and Career Ready Skills are to be taught throughout the course utilizing FFA and SAE programming found at the Kansas Ag Ed website. Specific activities may be found in the SAE for All Teachers Guide and at National FFA.org. The AFNR College and Career Ready Skills competencies can be found at Kansas Ag Ed.

Opportunities in Agriculture Education & FFA:Classroom and laboratory instruction integrates and/or is supplemented by experiential, project, and leadership and personal development through FFA .Students should be introduced to FFA through leadership activities and College and Career Ready Skills. Specific FFA information and activities may be found in the “National FFA Student Handbook, 16thedition”. Student activities, scoring rubrics, grading examples, and teacher lessons are all found in the “FFA Student Handbook Teachers Guide”. Additional information can be found at [www.ffa.org](http://www.ffa.org/).

Workplace Skills, Supervised Agricultural Experience and Record Keeping: Classroom and laboratory instruction integratesand/or is supplemented by experiential, project, and work based learning through SAE. Specific SAE activities that support the College and Career Ready Skills may be found in the “SAE for All Guide”. Students should be introduced to Foundational SAE’s and the AET student portfolio system. Student activities, scoring rubrics, grading examples, and teacher lessons are all found in the “SAE for All Teachers Guide”. Additional information is found in the SAE Individual Learning Guides and Teacher Editions and in the AFNR College and Career Ready Competency Profile found at *Kansas Ag* *Ed.*

Directions:The following competencies are required for full approval of this course. Check the appropriate number to indicate the level of competency reached for learner evaluation.

**RATING SCALE:**

4. Exemplary Achievement: Student possesses outstanding knowledge, skills or professional attitude.

3. Proficient Achievement:Student demonstrates good knowledge, skills or professional attitude. Requires limited supervision.

2. Limited Achievement:Student demonstrates fragmented knowledge, skills or professional attitude. Requires close supervision.

1. Inadequate Achievement:Student lacks knowledge, skills or professional attitude.

0. No Instruction/Training:Student has not received instruction or training in this area.

**Prerequisites: 18410 – Small Power Systems And either 18001 – Introduction to Agricultural Science or 18002 – Agriscience**

## Benchmark 1: The Ag Mechanics Industry and Careers

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 1.1 | Explain the importance of welding, mechanics, technical skills and construction in the local economy. |  |
| 1.2 | Identify local businesses that require ag mechanics skills. |  |
| 1.3 | List the causes of accidents in the Ag Mechanics workplace. |  |

## Benchmark 2: Safety / Ag Mechanics Lab Orientation w/ Tool Use

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 2.1 | Identify and demonstrate proper methods of shop/lab clean-up. |  |
| 2.2 | Identify various tool storage locations. |  |
| 2.3 | Learn the components of the fire triangle. |  |
| 2.4 | Explain the proper use of a fire extinguisher. |  |
| 2.5 | Explain proper shop safety color coding. |  |
| 2.6 | Complete a shop/lab safety test with 100% accuracy. |  |
| 2.7 | Explain the uses of agricultural mechanics hand tools. |  |
| 2.8 | Demonstrate use of hand tools properly and safely. |  |
| 2.9 | Explain the uses of power tools to perform agricultural mechanics tasks. |  |

## Benchmark 3: Small Engine Maintenance/Repair

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 3.1 | Integrate safety practices specific to Small Engine Repair and Maintenance. |  |
| 3.2 | Operate and perform necessary equipment for assembly and disassembly. |  |
| 3.3 | Review and examine maintenance schedules and procedures. |  |
| 3.4 | Identify and reference components, parts, models, and serial numbers. |  |
| 3.5 | Check fuel, lubricant and fluid levels. |  |
| 3.6 | Identify stress points and wear indicators. |  |
| 3..7 | Observe and operate computer and electronic diagnostic equipment. |  |
| 3.8 | Select, use and calibrate measuring and testing devices like calipers and gauges. |  |
| 3.9 | Calculate measurements with both standard and metric instruments. |  |
| 3.10 | Properly use, read, and calibrate micrometers. |  |
| 3.11 | Assess equipment and systems using diagnostics. |  |
| 3.12 | Demonstrate trouble-shooting procedures. |  |
| 3.13 | Diagnose wear and condition of parts. |  |
| 3.14 | Evaluate tolerances and perform needed repairs. |  |
| 3.15 | Differentiate between two and four cycle engines. |  |

## Benchmark 4: Tractor and Large Engine Power

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 4.1 | Describe engine theory of operation systems. |  |
| 4.2 | Perform gear and torques calculations. |  |
| 4.3 | Identify basic engine parts. |  |
| 4.4 | Describe the basic operation of engine systems, including: lubrication; cooling; governing; and fuel. |  |
| 4.5 | Identify components of the diesel fuel system. |  |
| 4.6 | Describe the operation of the injection system. |  |
| 4.7 | Describe the function of the powertrain. |  |
| 4.8 | Interpret torque, horsepower, and other units of power measurement. |  |

## Benchmark 5: Hydraulic Power

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 5.1 | Explain basic hydraulic theory & Boyles Law. |  |
| 5.2 | Describe open and closed systems. |  |
| 5.3 | Identify hydraulic pump types. |  |
| 5.4 | Compare types of pumps for specific applications. |  |
| 5.5 | Select hydraulic valves for specific purposes. |  |
| 5.6 | Identify types of hydraulic cylinders. |  |
| 5.7 | Perform hydraulic calculations related to speed, volume, force, capacities. |  |
| 5.8 | Identify types of hydraulic motors. |  |
| 5.9 | Identify components of hydraulic systems. |  |

## Benchmark 6: Electricity in Agriculture

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 6.1 | Identify common used tools and equipment in electricity. |  |
| 6.2 | Properly demonstrate the use of electrical tools. |  |
| 6.3 | Distinguish between AC and DC currents. |  |
| 6.4 | Identify common terms used in electricity. |  |
| 6.5 | Calculate the number of watts used by a device or a motor. |  |
| 6.6 | Calculate an electrical bill for a given set of devices. |  |
| 6.7 | Draw various wiring diagrams for different circuits. |  |
| 6.8 | Demonstrate correct procedure for installing switches, receptacles, and light fixtures. |  |
| 6.9 | Read schematics and sketch wiring control circuits. |  |
| 6.10 | Troubleshoot circuits using testing equipment. |  |
| 6.11 | Demonstrate the use of a multi-meter to measure various electrical loads. |  |

## Benchmark 7: Electrical Power

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 7.1 | Explain the theory of electrical motor operation. |  |
| 7.2 | Identify electrical motors and parts. |  |
| 7.3 | Select motor based on application. |  |
| 7.4 | Interpret motor nameplate data. |  |
| 7.5 | Interpret motor wiring connection diagrams. |  |
| 7.6 | Connect dual voltage motor to power source. |  |
| 7.7 | Change the direction of motor rotation. |  |
| 7.8 | Service and lubricate an electric motor. |  |
| 7.9 | Determine and calculate horsepower, torque, and load requirements of a motor. |  |

## Benchmark 8: Electrical Controls and Sensing Devices

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 8.1 | Connect with local equipment dealership (John Deere, CNH, AGCO, etc) for training and educational resources. |  |
| 8.2 | Interpret wiring diagrams. |  |
| 8.3 | Identify, explain and controls, including: thermostats; humidistats, photoelectric; magnetic relays; programmable controllers; time delay equipment; pressure switches; and limit switches. |  |
| 8.4 | Install low-voltage control equipment. |  |
| 8.5 | Connect motor controls. |  |
| 8.6 | Install low-voltage motor-control system. |  |
| 8.7 | Idenitfy, explain, and understand Controller Area Network (CAN) communcation. |  |
| 8.8 | Idenitfy, explain, and understand Pulse Width Modulation (PWM) and use cases in agricutlure. |  |
| 8.9 | Idenitfy common agricultural electrical connections and how to properly connect, disconnect, and clean the connection. |  |

I certify that the student has received training in the areas indicated.

Instructor Signature:

For more information, contact:

CTE Pathways Help Desk

(785) 296-4908

[pathwayshelpdesk@ksde.org](mailto:pathwayshelpdesk@ksde.org)



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