# 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.

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



900 S.W. Jackson Street, Suite 102

Topeka, Kansas 66612-1212

[https://www.ksde.org](https://www.ksde.org/)

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