# Agricultural Engineering and Technology Course No. 18415 Credit: 1.0

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

Pathways and CIP Codes:Agricultural Technology and Mechanical Systems (01.0201), Diversified Agricultural Science (01.0000)

Course Description: Agricultural Engineering Technology courses provide students with the skills and knowledge that are specifically applicable to the tools and equipment used in the agriculture engineering industry. In learning to apply basic technical knowledge and skills (engineering principles, project management, and automated systems, among others), students may explore a broad range of topics, including the operation, mechanics, and care of tools, technology and machines, electrical and biological engineering, automated systems, precision and emerging technologies.

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.

## Benchmark 1: Career Skills Focus – Communication Skills

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 1.1 | Summarize effective communication components. |  |
| 1.2 | List necessary documentation for effective communication. |  |
| 1.3 | Formulate organized outlines for technical papers. |  |
| 1.4 | Design tables, charts, and graphs for data illustration. |  |
| 1.5 | Evaluate and select appropriate visual aids for data communication. |  |
| 1.6 | Design and deliver presentations with supporting materials. |  |

## Benchmark 2: Laboratory and Facility Safety

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 2.1 | Outline steps for personal safety in a laboratory. |  |
| 2.2 | Demonstrate safety knowledge of tools, machines, and materials. |  |
| 2.3 | Exhibit proper care for tools, equipment, and facilities. |  |
| 2.4 | Recognize the impact of measurement errors on experiment results. |  |
| 2.5 | Differentiate between accuracy and precision. |  |

## Benchmark 3: Agricultural Engineering History and Industry

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 3.1 | Outline the evolution of agricultural technology. |  |
| 3.2 | Illustrate major agricultural technology milestones. |  |
| 3.3 | Assess the impact of each milestone. |  |
| 3.4 | Identify and explain societal impacts of agricultural engineering products. |  |
| 3.5 | Predict future developments in agricultural engineering. |  |

## Benchmark 4: Engineering Principles

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 4.1 | Define attributes of a successful engineer. |  |
| 4.2 | Understand the influence of ethics on engineering. |  |
| 4.3 | Consider social, environmental, and financial constraints in engineering. |  |
| 4.4 | List and explain the seven steps of the design process. |  |
| 4.5 | Identify basic flowcharting symbols and their functions. |  |
| 4.6 | Create flowcharts depicting manufacturing processes. |  |
| 4.7 | Apply flowcharting beyond manufacturing. |  |

## Benchmark 5: Project Management

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 5.1 | Grasp the concept of scope and assess project size. |  |
| 5.2 | Develop SWOT analysis for projects. |  |
| 5.3 | Determine resources and essential tasks for project completion. |  |
| 5.4 | Design timelines for assignments. |  |
| 5.5 | Create and present project management plans. |  |
| 5.6 | Implement project management skills for collaborative projects. |  |
| 5.7 | Develop strategies for managing project budgets. |  |

## Benchmark 6: Areas of Agricultural Engineering - Electrical Engineering

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 6.1 | Understand blueprint/schematic symbols for electronics and circuitry. |  |
| 6.2 | Define and explain direct and alternating currents. |  |
| 6.3 | Set up lab equipment for safe electronics design and testing. |  |
| 6.4 | Draw and label parts of a simple circuit. |  |
| 6.5 | Build and test series and parallel circuits to validate Ohm's and Kirchhoff's laws. |  |
| 6.6 | Utilize electrical meters for voltage, resistance, and current measurements. |  |
| 6.7 | Calculate circuit values using Ohm's law. |  |
| 6.8 | Use and understand measurement units for electronic parts. |  |

## Benchmark 7: Areas of Agricultural Engineering - Biological Engineering

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 7.1 | Define biological engineering in the agricultural industry. |  |
| 7.2 | Explain methods of biological engineering. |  |
| 7.3 | Describe applications of fermentation in food production and renewable energy. |  |
| 7.4 | Identify variables affecting CO2 production in yeast for fermentation. |  |
| 7.5 | Research the process of creating genetically modified organisms (GMOs). |  |
| 7.6 | Compare genetically modified organisms to non-modified organisms. |  |
| 7.7 | Demonstrate genetic modification using tools like CRISPR. |  |

## Benchmark 8: Automated Systems (CNC Machines, 3-D Printers, Robotic Arms)

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 8.1 | Describe the shift from manual to automated design and construction. |  |
| 8.2 | Discuss advantages and disadvantages of automated systems. |  |
| 8.3 | Use programs to control automated systems. |  |
| 8.4 | Read and interpret G & M codes. |  |
| 8.5 | Generate code for automated systems. |  |
| 8.6 | Power up and down computer and equipment for calibration. |  |
| 8.7 | Produce various products from blueprint/working drawings using automated systems. |  |

## Benchmark 9: Precision Agriculture

### Competencies

| **#** | **Description** | **Rating** |
| --- | --- | --- |
| 9.1 | Define precision agriculture. |  |
| 9.2 | Understand the scope of precision agriculture. |  |
| 9.3 | Explore global positioning systems and their role. |  |
| 9.4 | Investigate GIS in precision farming and site-specific crop production. |  |
| 9.5 | Understand database management systems in precision agriculture. |  |
| 9.6 | Define remote sensing and its role in precision farming. |  |
| 9.7 | Identify factors influencing crop yield. |  |
| 9.8 | Understand spatial variability and soil sampling. |  |
| 9.9 | Explore variable rate technology. |  |
| 9.10 | Understand the application of variable rate technology. |  |
| 9.11 | Identify methods for measuring grain yield. |  |
| 9.12 | Evaluate benefits and limitations of yield maps. |  |
| 9.13 | Generate a vision for the future of precision agriculture. |  |

## Benchmark 10: Emerging Technologies (These are generic competencies for emerging technologies relevant to your local program***)***

### Competencies

| **#** | **Description** | **rating** |
| --- | --- | --- |
| 10.1 | Demonstrate research skills for identifying and evaluating emerging technologies. |  |
| 10.2 | Seek and identify information sources on new technology. |  |
| 10.3 | Identify problems and solutions related to new technology. |  |
| 10.4 | Identify areas most impacted and with potential for new technologies. |  |
| 10.5 | Explain the importance for professionals to stay informed about evolving technologies. |  |
| 10.6 | Discuss advantages, disadvantages, and prospects of emerging technologies. |  |
| 10.7 | In-depth discussion of a chosen emerging technology based on independent research. |  |
| 10.8 | Develop a plan for anticipating change. |  |

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/)

The Kansas State Department of Education does not discriminate on the basis of race, color, national origin, sex, disability or age in its programs and activities and provides equal access to any group officially affiliated with the Boy Scouts of America and other designated youth groups. The following person has been designated to handle inquiries regarding the nondiscrimination policies: KSDE General Counsel, Office of General Counsel, KSDE, Landon State Office Building, 900 S.W. Jackson, Suite 102, Topeka, KS 66612, (785) 296-3201.