

# **High School Agriscience Education - Agriscience Power and Systems Technology**

## **1. Historical Applications and Future Implications of Agriscience Power and Systems Technology**

## **2. Safety**

## **3. Machinery and Equipment Systems**

## **4. Industry and Marketing Systems**

## **5. Energy Systems**

## **6. Structural Systems**

## **7. Environmental and Natural Resource Systems**

## **8. Career Opportunities in Agriscience Power and Systems Technology**

### **Courses in AGRISCIENCE POWER AND SYSTEMS TECHNOLOGY might include:**

Introductory Agriscience, Introductory Agriscience Mechanics, Farm Shop, Agriscience Mechanics Applications, Welding and Fabrication, Agriscience Structures, Power Machinery, Small Engine Technology, Agriscience Systems and Controls, and Agribusiness

### **Possible Agriscience Power and Systems Technology Sequences:**

#### **Suggested Introductory Courses:**

Introductory Agriscience  
Introductory Agriscience Mechanics  
Introductory Agriscience Mechanics

#### **Suggested Intermediate Courses:**

Small Engine Technology  
Advanced Agriscience Mechanics  
Welding & Fabrication

#### **Suggested Advanced Courses:**

Power Machinery  
Agriscience Structures  
Agriscience Systems and Controls

## **CONTENT STANDARD 1: HISTORICAL APPLICATIONS AND FUTURE IMPLICATIONS OF AGRISCIENCE POWER AND SYSTEMS TECHNOLOGY**

**STUDENTS WILL UNDERSTAND THE DEVELOPMENT AND APPLICATION OF AGRISCIENCE POWER AND SYSTEMS TECHNOLOGY**

**A: Indicators of Achievement: describe and discuss the historical development of agriscience power and systems technology**

**Sample Skill Activities:**

1. construct a timeline of world and US agricultural history
2. develop student display of agricultural inventions and innovations
3. view John Deere Field Day videos and discuss technology advances
4. visit Delaware Agricultural Museum, Walter Messick Farm Machinery Museum, Hagley Museum and discuss the historical and technological events over the past 200 years in agriscience

**Cross-Curricular Connections:**

Social Studies History Standards 1-4  
Social Studies Geography Standard 2

**B: Indicators of Achievement: identify global applications of agriscience power and systems technology**

**Sample Skill Activities:**

1. geographically represent the uses of power and technology
2. chart differences in animal, wind, water, solar power and alternative fuels
3. demonstrate the use of power
4. access and use computer information
5. display student research on types of agricultural power
6. illustrate uses of global positioning systems, precision application and monitoring systems, computer assisted design models, and electronic control systems in agriscience

**Cross-Curricular Connections:**

Social Studies Geography Standards 1-4  
Science Standards 1, 3  
English Language Arts Standards 1, 3

**C: Indicators of Achievement: recognize agriscience power sources**

**Sample Skill Activities:**

1. visit local agricultural power equipment dealers
2. display student research on types of agriscience power
3. report and discuss new and emerging agriscience power technologies
4. identify alternative power sources
5. identify innovative technology applications and

**Cross-Curricular Connections:**

English Language Arts Standards 1, 3  
Science Standards 1, 3, 5

uses in agriscience

**D: Indicators of Achievement: use the scientific method in agriscience power and systems technology**

**Sample Skill Activities:**

1. develop a chart of the steps in the scientific method
2. relate the development of modern agriscience power and systems technologies to the scientific method
3. set-up a scientific experiment dealing with agriscience engineering
4. conduct a visioning process to address future agriscience engineering challenges

**Cross-Curricular Connections:**

- Science Standard 1
- Social Studies History Standards 1-4  
English Language Arts Standards 1-2

**CONTENT STANDARD 2: SAFETY**

**STUDENTS WILL DEVELOP A SAFE WORK ATTITUDE AND DEMONSTRATE SAFE WORKING HABITS**

**A: Indicators of Achievement: Demonstrate positive safety attitudes responsibilities**

**Sample Skill Activities:**

1. discuss personal safety experiences
2. view safety videos, movies, shows and discuss safety responsibilities
3. review safety procedures of equipment and owner manuals
4. identify safety agencies and services
5. Delaware Farm Safety Extension Specialist, a guest speaker (856-7303) to discuss industry safety standards
6. assign student personal safety equipment and class responsibilities

**Cross-Curricular Connections:**

- English Language Arts Standards 1-3

**B: Indicators of Achievement: recognize and demonstrate safety rules and regulations**

**Sample Skill Activities:**

1. sign and file student safety obligation agreement
2. post and display class, laboratory and shop safety rules
3. post and discuss school safety rules

**Cross-Curricular Connections**

- English Language Arts Standards 1-4

4. review Right-To-Know legislation and procedures

5. conduct safety inspections and evaluations

**B: Indicators of Achievement:** observe and participate in safety demonstrations

**Sample Skill Activities:**

**Cross-Curricular Connections**

1. practice safety drills

English Language Arts Standards 1-3

2. perform safety equipment maintenance

3. develop and practice safety reporting procedures

4. conduct tool and equipment safety demonstrations and testing

5. review and display **Delaware Safety Manual**, Sections A-J, Dept. of Ed

6. complete tool and equipment safety inspections

### **CONTENT STANDARD 3: MACHINERY AND EQUIPMENT SYSTEMS**

**STUDENTS WILL DISASSEMBLE, ASSEMBLE, REPAIR, INSPECT AND EVALUATE MACHINERY AND EQUIPMENT SYSTEMS**

**A: Indicators of Achievement:** review and examine service schedules and procedures

**Sample Skill Activities:**

**Cross-Curricular Connections:**

1. identify and reference components, parts, model and serial numbers

English Language Arts Standards 1-3

2. gather pre-service information

3. examine service schedules and maintenance procedures

4. check fuel, lubricant and fluid levels

5. identify record keeping procedures

6. identify stress points and wear indicators

7. write and schedule service or work

8. observe and operate computer and electronic trouble shooting procedures

**B: Indicators of Achievement:** select, use and calibrate measuring and testing devices

**Sample Skill Activities:**

**Cross-Curricular Connections**

1. measure with and use both Standard and Metric

Mathematics Standards 5, 6

rulers

Science Standard 1

2. Conduct integrated measuring practices with small project exercises such as cutting lumber, fitting pipe, etc.

3. use a micrometer

4. use calipers and gauges

5. complete student measuring practices

6. calibrate measuring devices

7. use computer models to assess equipment and systems operation

8. identify and observe system sensors and regulators used to operate equipment and systems

**C: Indicators of Achievement: perform disassembly and assembly procedures**

**Sample Skill Activities:**

1. demonstrate trouble shooting procedures

2. develop check-lists for trouble shooting procedures Mathematics Standards 1-6

3. prepare lab areas for repairs (assemble tools and equipment, make space, access time management)

4. conduct inspection procedures

5. prepare and practice disassembly

6. check for wear and condition

7. clean and prepare parts for re-use

8. evaluate tolerances and access repairs needed

9. complete assembly procedures

10. test and adjust to specifications

11. review and evaluate work completed

**Cross-Curricular Connections:**

Science Standards 1-3

**D: Indicators of Achievement: demonstrate disposal and storage procedures**

**Sample Skill Activities:**

1. catalog parts and store equipment

2. complete fuel, lubricant and fluid recycling and

**Cross-Curricular Connections**

Science Standards 1-2

English Language Arts Standards 1-3

storage practices

3. store equipment and demonstrate management procedures and practices
4. clean tools, equipment and facilities and conduct work area inspection
5. complete tool and equipment return procedures
6. secure safety equipment and facilities

**E: Indicators of Achievement: demonstrate the safe use of laboratory equipment in practical applications**

**Sample Skill Activities:**

1. demonstrate student proficiency on laboratory machinery and equipment
2. demonstrate safe laboratory practices
3. complete student competency checklist **Delaware Safety Manual**, Dept. of Ed
4. review operator safety manuals on all laboratory equipment
5. perform safety and prestart procedures
6. demonstrate equipment shut-down procedures

**Cross-Curricular Connections:**

English Language Arts Standards 1-3

**F: Indicators of Achievement: engage and operate machinery and equipment power**

1. demonstrate power engagement for all laboratory equipment
2. outline safe operation procedures for all laboratory equipment
3. make a video of safe machinery and equipment systems operation
4. view equipment manufacturer operation videos and discuss proper engagement procedures
5. view safety videos from the Delaware Extension Safety Specialist (856-7303) and discuss equipment operator safety

English Language Arts Standards 1-3  
Science Standards 1-3

**G. Indicators of Achievement: observe and demonstrate auxiliary machinery and equipment systems**

**Sample Skill Activities**

1. build a pictorial display of auxiliary machinery and equipment uses

**Cross-Curricular Connections:**

Science Standard 1

2. identify emerging uses of machinery and equipment systems technologies
3. complete student competency checklists and examinations

## **CONTENT STANDARD 4: AGRISCIENCE INDUSTRY MARKETING SYSTEMS**

STUDENTS WILL DEMONSTRATE THE ECONOMIC IMPORTANCE OF SOUND BUSINESS PRACTICES AND A PROFESSIONAL WORK ETHIC

### **A. Indicators of Achievement: demonstrate agribusiness skills and competencies**

#### **Sample Skill Activities:**

1. follow directions and complete assignments
2. solve customer problems related to agricultural sales and marketing
3. participate in the FFA Agricultural Sales and FFA Marketing Plan Career Development Events
4. take delivery directions and plan to make deliveries
5. complete business reports and write business letters
6. use computers to accomplish work and communicate with others
7. identify and list personal attributes that contribute to a sound work ethic
8. read and interpret technical manuals, reports and directions
9. identify and use appropriate office and customer relations equipment
10. read and interpret drawings, plans and symbols
11. complete an inventory and construct a bill of materials
12. work with others to solve problems
13. demonstrate self-motivation and time management
14. maintain records and accounts
15. interact with different personalities

#### **Cross-Curricular Connections:**

- English Language Arts Standards 1-4
- Social Studies Econ Standards 2-4
- Science Standard 1
- Mathematics Standard 2, 5-6

## **B. Indicators of Achievement. understand regulations, safety and consumer protection**

1. identify government regulations as they pertain to agriculture and the consuming public  
Social Studies Economics Standards 1-4  
Science Standard 1
2. investigate international regulations that effect American agricultural products, technologies and marketing  
English Language Arts Standard 1
3. identify new agriscience technologies and discuss their global importance
4. discuss the responsibilities of producers, processors and distributors of agricultural products and services
5. identify the costs inherent in operating a business or providing a service
6. identify consumer protection agencies and describe their focus in agriscience

## **CONTENT STANDARD 5: ENERGY SYSTEMS**

### **STUDENTS WILL DEMONSTRATE AND EXPLAIN OPERATIONS OF AGRISCIENCE ENERGY SYSTEMS**

#### **A. Indicators of Achievement: identify the parts and functions of agriscience energy systems**

##### **Sample Skill Activities:**

1. identify parts of the specific energy systems of mechanical power, solar power, wind power, electrical power, and chemical power systems

##### **Cross-Curricular Connections:**

- Science Standards 1-3, 5-6  
English Language Arts Standards 1-3

2. utilize circuit diagrams, and flow charts to evaluate and analyze energy systems
3. discuss and explain the operating principles for energy systems
4. explain and describe principles of power transmission, heat transfer, evaporation, fluid movement, conductivity, satellite transmission, conservation, sensing and regulation
5. describe computer applications in energy systems management
6. identify emerging technologies and their integration with energy systems
7. problem solve using energy systems and their components
8. investigate alternative energy systems and their

economic impact

9. use measuring tools and testing equipment to evaluate energy systems

**B. Indicators of Achievement - demonstrate practical skills in energy systems operation**

- |  |                                     |
|--|-------------------------------------|
| 1. start, stop and adjust energy systems operation   | Science Standards 1-3, 5-6, 8       |
| 2. perform energy system maintenance, testing and evaluation   | English Language Arts Standards 1-3 |
| 3. safely use hand and power tools   |                                     |
| 4. adjust energy systems sensors, gauges, governors and controls to maintain efficient operation   |                                     |
| 5. select fuels, coolants, fluids and lubricants for energy systems  |                                     |
| 6. select appropriate industry standards for energy systems applications that include; National Electric Code, Electrical Testing Laboratory, Factory Mutual, Underwriters Laboratory, Canadian Standard Association, and OSHA standards |                                     |
| 7. observe electronic testing and the use of interactive electronic devices to evaluate energy systems operation   |                                     |
| 8. integrate several energy systems to operate an aquaculture system, a greenhouse, an animal science facility, a natural resources system or an agriscience power and systems laboratory  |                                     |

**CONTENT STANDARD 6: STRUCTURAL SYSTEMS**

**STUDENTS WILL IDENTIFY AND DETERMINE AGRISCIENCE STRUCTURE SYSTEM COMPONENTS AND SPECIFICATIONS**

**A. Indicators of Achievement: identify variables relating to structures system components**

**Sample Skill Activities**

1. conduct a structure site evaluation
2. interpret plans and drawings
3. develop a list of materials and itemized bid list
4. determine structure codes and current regulations

**Cross-Curricular**

**Connections:**  
Mathematics Standards 1, 3, 5, 7-8

Science Standards 1-3, 5

English Language Arts Standards 1-3

5. use hand and power tools safely
6. lay out a structure foundation, erect batter boards, frames or forms
7. evaluate building construction methods
8. estimate handling materials, cost and construction time
9. identify lumber and manufactured wood product grade stamps
10. identify alternative construction styles
11. calculate ventilation, electric, water, heating and cooling needs
12. identify and select appropriate frame, siding, roofing, insulation and vapor barrier materials
13. use CAD to design, incorporate, and itemize structure systems
14. compare lease, rent and own options for structure systems
15. contact local material handlers and systems component providers to determine least cost and best source availability of systems materials

**B. Indicators of Achievement - demonstrate structure system skills in the management, construction or operation of an agriscience structure system**

- |   |  |
|---|--|
| 1. operate or manage an aquaculture system, a greenhouse system, an animal science system, a natural resource system, or a machinery and equipment system | Mathematics Standards 1, 5, 7-8<br>Science Standards 1-3, 5-6<br>English Language Arts Standards 1-3 |
| 2. use a transit to determine slope   |  |
| 3. square corners using the 3,4-5 triangle method   |  |
| 4. select and apply structure fasteners   |  |
| 5. prepare and apply paint, coatings or finishes  |  |
| 6. calculate, mix and finish concrete and mortar  |  |
| 7. fabricate and install reinforcing materials  |  |
| 8. adjust, set or maintain structure systems controls and monitors  |  |
| 9. calculate heating, cooling and ventilation needs for structure systems   |  |

10. safely use hand and power tools
11. prepare structure systems for code and regulatory inspections
12. calculate electric loads and design circuits for structure systems
13. evaluate structure systems for safety equipment needs and availability
14. conduct structure systems inspection to determine handicapped accessibility
15. schedule and conduct necessary structure systems maintenance
16. plan and prepare water and sewer component systems for a particular structure
17. design, install and maintain basic landscape materials for a particular structure
18. design and construct associated system components for a particular structure such as an ornamental pond, garden, out building, walkway, or deck
19. safely store and maintain structure materials and supplies

## **CONTENT STANDARD 7: ENVIRONMENTAL AND NATURAL RESOURCE SYSTEMS**

### **STUDENTS WILL DEMONSTRATE PRINCIPLES AND PROCEDURES IN ENVIRONMENTAL AND NATURAL RESOURCE SYSTEMS MANAGEMENT**

#### **A. Indicators of Achievement - identify environmental and natural resource system procedures and practices**

- |  |   |
|--|---|
| 1. identify environmental problems in livestock, crop handling, processing, nursery and landscaping, aquaculture, forestry, and agribusiness | Science Standards 1-8<br>Mathematics Standards 1, 3, 5, 7-8                   |
| 2. read and interpret maps including land use, conservation, soils, topographic, aerial and remote sensing, and geological surveys           | English Language Arts Standards 1-3<br>Social Studies Geography Standards 1-4 |
| 3. describe principles involved in appropriate conservation and land use planning  |   |
| 4. read legal land descriptions and determine land areas   |   |
| 5. determine elevation, slope and grades   |   |
| 6. select water management techniques for appropriate  |   |

land form situations that might include grassed waterways, terracing, tile drain systems, or other erosion control structures

7. determine and select appropriate cultural tillage or mechanical practices of equipment for specific soil type and residue management

8. determine practices to improve or maintain water quality and recharge

9. determine soil capabilities, structure, and use classification

10. understand pressure, flow and head

11. select pumps and power sources and compare efficiencies

12. identify and evaluate waste disposal systems

13. identify natural resource uses and appropriate management practices

14. identify environmental and natural resource needs and plans for their

conservation and preservation

15. display natural resources and promote wise management practices

16. participate in Envirothon training

17. identify environmental and natural resource organizations and service agencies

**B. Indicators of Achievement - demonstrate skills appropriate for the management of environmental and natural resource systems**

1. read and interpret maps and global positioning systems

Science Standards 1-8

Mathematics Standards 1, 5, 7-8

2. calculate land areas, slope, flow and volumes in environmental and natural resource systems

Social Studies Geography Standards 1-4

3. utilize natural resource areas to solve environmental problems

English Language Arts Standards 1-4

4. use survey and leveling equipment

5. safely use hand and power equipment

6. measure and determine water quality parameters
7. demonstrate compass proficiency
8. use forestry tools and equipment
9. describe surface and subsurface drainage and irrigation techniques
10. describe alternative land utilization and conservation techniques such as xeriscaping
11. lay out contour lines and grade stakes
12. calculate areas and volumes
13. measure crop residues and determine soil loss
14. assemble environmental and natural resource system equipment and devices
15. construct conservation structures
16. construct wildlife management devices
17. establish and maintain environmental and natural resource systems monitoring plans
18. utilize conservation and recycling procedures and techniques
19. compare conventional spray and precision spray application of materials
20. evaluate current local land use plans the impact on environmental and natural resource systems
21. formulate plans that address the impact of agriscience production systems on the environment and natural resources
22. discuss the impact that emerging technologies will have on current and future environmental and natural resource systems
23. volunteer for forest, wetland, wildlife area or other natural resource service
24. coordinate local efforts of service organizations to preserve and conserve

environmental and natural resource systems

## **CONTENT STANDARD 8: CAREER OPPORTUNITIES IN AGRISCIENCE POWER AND SYSTEMS TECHNOLOGY**

### **STUDENTS WILL INVESTIGATE CAREER OPPORTUNITIES IN AGRISCIENCE POWER AND SYSTEMS TECHNOLOGY**

#### **A. Indicators of Achievement - examine career opportunities in agriscience power and systems technology**

1. investigate the diversity of careers in agriscience power and English Language Arts systems Standards 1-4
2. visit job-sites
3. invite guest speakers from industry
4. engage in career guidance counseling
5. conduct student interest inventory tests
6. attend career or job fairs
7. contact agricultural engineering professional organizations

#### **B. Indicators of Achievement - identify advanced training post-secondary education in agriscience engineering and systems technology and**

1. attend college information fairs English Language Arts Standard 3
2. examine labor market information
3. request post-secondary information
4. access post-secondary institutions via the Internet
5. contact agricultural engineering and technology professional organizations
6. Tech-Prep articulation agreements
7. speak with college recruitment advisor

#### **C. Indicators of Achievement - demonstrate leadership development**

1. become a member of the FFA English Language Arts Standards 1-3
2. participate in parliamentary procedure practices and exercises
3. set personal and career goals

4. participate in FFA Chapter meetings
5. attend State FFA leadership events
6. participate in National FFA leadership events
7. establish, maintain and complete an FFA SAE project
8. plan, prepare and present a speech
9. participate in FFA committee work
10. review **FFA Manual** and **FFA Student Handbook**
11. establish FFA Degree applications
12. attend FFA Chapter Safety Committee meetings
13. view and discuss FFA Leadership videos
14. participate in FFA community service activities
15. identify and list personal attributes that contribute to a sound work ethic
16. work with others to solve problems
17. interact with diverse personalities

**D. Indicators of Achievement - arrange and assess SAE projects, research and experiences**

1. examine entrepreneurship experiences English Language Arts Standards 1-4
2. investigate wage-earning experiences
3. participate in school-to-work training
4. participate in cooperative learning
5. engage in shadowing experiences
6. participate in school-site experiences
7. conduct an agriscience research project
8. complete integrated learning projects
9. prepare for student graduation reviews
10. prepare a senior project or portfolio

**E. Indicators of Achievement - develop communication and interpersonal skills**

1. use computer and word processing
2. participate in FFA Public Speaking & Extemporaneous Speaking Career Development Events
3. write a job resume´
4. complete reports and work orders
5. conduct and present technical reviews
6. use telephone and fax communications
7. send e-mail communications
8. complete integrated writing assignment
9. role play customer relation exercises
10. participate in the FFA Agricultural Sales Career Development Event