

**OFFICE OF CHIEF ACADEMIC OFFICER**  
**Summary of State Board of Education Agenda Items**  
**Consent Agenda**  
**January 20, 2022**

**OFFICE OF CAREER AND TECHNICAL EDUCATION**

- D. Approval to revise selected Mississippi Secondary Curriculum Frameworks in Career and Technical Education  
(Has cleared the Administrative Procedures Act process without public comments)

**Executive Summary**

The Mississippi Secondary Curriculum Frameworks have a two-year or four-year curricula revision cycle. The revision cycle includes input from local district personnel and business/industry partners. Approved secondary curricula will be disseminated for implementation in the 2022-2023 school year.

The following secondary curriculum frameworks have cleared the Administrative Procedures Act process with no public comments and are recommended for approval.

01. Principles of Agriscience (Miss. Admin. Code 7-180)
02. Diversified Agriculture Mechanization Core (Miss. Admin. Code 7-171)
03. Diversified Agriculture Plants Core (Miss. Admin. Code 7-177)
04. Diversified Agriculture Animals Core (Miss. Admin. Code 7-173)
05. Diversified Agriculture Environment Core (Miss. Admin. Code 7-175)
06. Diversified Agriculture Agribusiness Core (Miss. Admin. Code 7-179)
07. Early Childhood Education (Miss. Admin. Code 7-166)
08. Cosmetology (Miss. Admin. Code 7-80)
09. Architecture and Drafting (Miss. Admin. Code 7-151)
10. Furniture Design and Manufacturing (Miss. Admin. Code 7-155)
11. Automotive Service Technician (Miss. Admin. Code 7-128)

All curricula frameworks are designed to provide local programs with an instructional foundation that can be used to develop localized instructional management plans and course syllabi. Additionally, the frameworks include the following elements for each revised secondary curriculum:

- ❖ Program
- ❖ Description
- ❖ Classification of Instructional Program (CIP) Code and CIP Name

- ❖ Course Outline and Codes
  - Curriculum
  - Student Competencies
  - Suggested Student Objectives

Recommendation: Approval

Back-up material attached

## **Summary of Secondary Curricula Changes for Career and Technical Education**

### **2022 Principles of Agriscience**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- New course name.
- Combined former Concepts of Agriscience and Introduction to Agriscience documents into one new curriculum.
- Unit 1: Pulled from Introduction to Agriscience.
- Unit 2: Pulled from Introduction to Agriscience.
- Unit 3: Combined Unit 2 of Concepts of Agriscience and Unit 3 of Introduction to Agriscience.
- Unit 4: New unit, revising Unit 3 of Concepts of Agriscience and Unit 4 of Introduction to Agriscience to meet new National FFA language for Supervised Agricultural Experience (SAE) programs.
- Unit 5: Combined Unit 5 of Introduction to Agriscience and Unit 8 from Concepts of Agriscience.
- Unit 6: Combined Unit 4 from Concepts of Agriscience and Unit 10 from Introduction to Agriscience.
- Unit 7: Pulled from Unit 6 in Introduction to Agriscience.
- Unit 8: Combined Unit 5 in Concepts of Agriscience and Unit 8 in Introduction to Agriscience.
- Unit 9: Combined Unit 6 in Concepts of Agriscience and Unit 7 in Introduction to Agriscience.
- Unit 10: Pulled from Unit 9 of Concepts of Agriscience.

### **2022 Diversified Agriculture Mechanization Core**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- New course name.
- Combined former AEST Science of Agricultural Mechanization Levels I and II.
- Unit 1: Combined Unit 1 from both Level I and II while adding new National FFA language for Supervised Agricultural Experience (SAE) programs.
- Unit 2: Pulled from Unit 2 of Level I.
- Unit 3: Pulled from Unit 2 of Level II.
- Unit 4: New unit.
- Unit 5: Renamed and revised Unit 3 from Level I.
- Unit 6: Pulled from Unit 3 of Level II.
- Unit 7: Pulled from Unit 4 of Level II.
- Unit 8: Combined Units 6 and 7 from Level II.
- Unit 9: Pulled from Unit 5 of Level II.

### **2022 Diversified Agriculture Plants Core**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- New course name.
- Combined former AEST Science of Agricultural Plants Levels I and II.
- Unit 1: Combined Unit 1 from both Level I and II while adding new National FFA language for Supervised Agricultural Experience (SAE) programs.
- Unit 2: Renamed Unit 2 from Level II.
- Unit 3: Pulled from Unit 3 of Level II.
- Unit 4: Renamed Unit 4 from Level II.
- Unit 5: Pulled from Unit 6 of Level I and Unit 5 of Level II.
- Unit 6: Pulled from Unit 6 of Level II.
- Unit 7: Pulled from Unit 7 of Level II.
- Unit 8: Pulled from Unit 8 of Level II.
- Unit 9: Renamed Unit 9 from Level II.
- Unit 10: Pulled from Unit 10 of Level II.
- Unit 11: Renamed Unit 11 from Level II.

### **2022 Diversified Agriculture Animals Core**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- New course name.
- Combined former AEST Science of Agricultural Animals Levels I and II.
- Unit 1: Combined Unit 1 from both Level I and II while adding new National FFA language for Supervised Agricultural Experience (SAE) programs.
- Unit 2: Pulled from Unit 2 of Level I.
- Unit 3: New unit from National Beef Quality Assurance curriculum.
- Unit 4: Pulled from Unit 2 of Level II.
- Unit 5: Pulled from Unit 3 of Level I.
- Unit 6: Pulled from Unit 5 of Level I.
- Unit 7: Pulled from Unit 4 of Level II.
- Unit 8: Pulled from Unit 5 of Level II.
- Unit 9: Pulled from Unit 6 of Level II.
- Unit 10: Pulled from Unit 8 of Level I and Unit 7 of Level II.

### **2022 Diversified Agriculture Environment Core**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- New course name.
- Combined former AEST Science of Agricultural Environment Levels I and II.

- Unit 1: Combined Unit 1 from both Level I and II while adding new National FFA language for Supervised Agricultural Experience (SAE) programs.
- Unit 2: Pulled from Unit 2 of Level II.
- Unit 3: Pulled from Unit 3 of Level II.
- Unit 4: Pulled from Unit 4 of both Level I and II.
- Unit 5: Pulled from Unit 5 of Level II.
- Unit 6: Pulled from Unit 6 of both Level I and II.
- Unit 7: Pulled from Unit 7 of both Level I and II.

### **2022 Diversified Agriculture Agribusiness Core**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- New course name.
- Combined former AEST Science of Agribusiness Levels I and II.
- Unit 1: Combined Unit 1 from both Level I and II while adding new National FFA language for Supervised Agricultural Experience (SAE) programs.
- Unit 2: Combined Unit 2 from Levels I and II.
- Unit 3: Combined Unit 3 from Levels I and II.
- Unit 4: Pulled from Unit 4 of Level I.
- Unit 5: Pulled from Unit 4 of Level II.
- Unit 6: Pulled from Unit 5 of Level II.
- Unit 7: Pulled from Unit 6 of Level II.
- Unit 8: Combined Unit 5 from Level I and Unit 7 from Level II.
- Unit 9: Pulled from Unit 8 of Level II.
- Unit 10: Combined Unit 6 from Level I and Unit 9 from Level II.
- Unit 11: Pulled from Unit 10 of Level II.

### **2022 Early Childhood Education**

- Document placed in newest curriculum format.
- Adjusted competencies and objectives to facilitate College and Career Ready standards and 21<sup>st</sup> Century Learning.
- Reduced the number of units from 11 to 8
- Unit 1 changed to Program Orientation, competencies and objectives updated.
- Unit 2 changed to Child Development: Infants – Three Year Old's, competencies and objectives updated.
- Unit 3 changed to Child Development II: Four Year Old's and Special Needs Population, competencies and objectives updated.
- Unit 4 changed to Preparing a Healthy and Safe Environment, competencies and objectives updated.
- Unit 5 changed to Learning Environment, competencies and objectives updated.
- Unit 6 changed to Curriculum Development, competencies and objectives updated.

- Unit 7 changed to Family and Community Relationships, competencies and objectives updated.
- Unit 8 changed to Career Development and Professionalism, competencies and objectives updated.
- Unit 10 changed to Hairstyling, competencies and objectives updated.
- Previous Unit 10, Management and Administration was integrated throughout all units.
- Unit 6 was deleted.
- Competencies and objectives in the previous Unit 5 are integrated in Units 2, 3, 5, and 6.
- Competencies and objectives in the previous Unit 7 are integrated in Units 4 and 5.
- Student Competency Profile changed to reflect unit moves/updates.
- Moved Unit references (Appendix A) to Teacher Resource Document.
- Edited appendices to reflect new standards and industry alignment.

### **2022 Cosmetology**

- Document placed in newest curriculum format.
- Adjusted competencies and objectives to facilitate College and Career Ready standards and 21<sup>st</sup> Century Learning.
- Reduced the number of units from 21 to 16.
- Unit 1 title changed to Program Orientation, competencies and objectives updated.
- Unit 2 title changed to Safety and Infection Control, competencies and objectives updated.
- Unit 3 changed to Anatomy and Physiology, competencies and objectives updated.
- Unit 4 changed to Introduction to Skin and Nail Care, competencies and objectives updated.
- Unit 6 changed to Basic Chemistry and Electricity, competencies and objectives updated.
- Unit 7 changed to Principles of Hair Design, competencies and objectives updated.
- Unit 8 changed to Shampooing and Conditioning, competencies and objectives updated.
- Unit 9 changed to Haircutting, competencies and objectives updated.
- Unit 10 changed to Hairstyling, competencies and objectives updated.
- Unit 11 changed to Braids, Hair Additions, and Enhancements, competencies and objectives updated.
- Unit 12 changed to Chemical Texture Services, competencies and objectives updated.
- Unit 13 changed to Hair Coloring, competencies and objectives updated.
- Unit 14 changed to Facials and Makeup, competencies and objectives updated.

- Unit 16 changed to Professional Development, competencies and objectives updated.
- Unit 18 and 19 were combined into Unit 14, competencies and objectives updated.
- Unit 17 was deleted.
- Unit 20 was deleted, and the competencies and objectives were combined into Unit 15.
- Unit 21 was deleted, and the competencies and objectives were revised and added to Unit 16.
- Student Competency Profile changed to reflect unit moves/updates.
- Moved Unit references (Appendix A) to Teacher Resource Document.
- Edited appendices to reflect new standards and industry alignment.

### **2022 Architecture and Drafting**

- Autodesk Certified User: AutoCAD added to Pathway Description and College, Career, and Certifications.
- Grade Level and Class Size Recommendations: Changed class grade level to 9<sup>th</sup> grade.
- Added: It is preferred that the student complete the program in consecutive years. If not, it is recommended the student complete in no more than three years.
- Course Outline – description and hours adjusted to curriculum changes.
- Career Pathway Outlook – Current and Projected Occupation Report updated.
- Unit 1: Orientation—Removed Competency 2 (included in new unit 2).
- Unit 2: Fundamentals of Student Organizations—New Unit.
- Subsequent units re-numbered.
- Net and gross square feet, and BOMA calculations added to Unit 14.
- Unit 17: Residential Architectural Drafting III—Removed 8.c. Plot the X and Y values of the Cartesian Coordinate System.
- Old Unit 17: Field Applications of Architectural Drafting—Removed (Content is contained in Units 1 and 13).
- Commercial and industrial mentioned throughout document to broaden job outlook for students.
- Code mentioned where appropriate.
- Industry Standards updated for ADDA.
- Autodesk Certified User – AutoCAD standards added.

### **2022 Furniture Design and Manufacturing**

- Course Outline – description and hours adjusted to curriculum changes.
- Career Pathway Outlook – Current and Projected Occupation Report updated.
- Added NCCER Core Units to Year One.
- Subsequent units re-numbered.
- Unit 1: Introduction to Furniture Manufacturing.

- Competency removed – now located in employability Unit.
  - Removed Competency 3 (included in new unit 2).
- Unit 3: Fundamentals of Student Organizations—New Unit.
- Unit 3: General Safety moved to Unit 5 Basic Safety.
- Unit 4: Tool and Equipment Identification and Use Moved to Year 2 Now Unit 17.
  - Changed 2.f from Describe the function of machines used in frame building. (changed function to operation).
- Unit 6: Furniture Frame Patterns I (removed and Layout) now Unit 11.
  - 1.a. removed and layout.
- Unit 7: Cutting and Assembling Frames I Now Unit 12.
  - 1.a. changed radial arm saw to miter saw.
- Unit 8: Measure, Lay Out, and Cut Fabrics I Now Unit 13.
  - Competency 3: changed Identify to Apply.
- Unit 9: Sewing Procedures I Now Unit 14.
  - 1.c. changed to Describe each part of a sewing machine and the tasks they perform.
  - Competency 2 added a. Thread a sewing machine.
  - and b. became b. and c.
- Furniture Upholstery I Now Unit 15.
- Removed old Unit 10: Special Topics in Furniture Manufacturing and Upholstery I.
- Unit 11: Name changed to Orientation and Safety Now Unit 16.
  - Added Competency 1.
  - Changed Material Safety Data Sheet (MSDS) to Safety Data Sheet (SDS).
  - Removed Objective 2.b. Describe the approved storage procedures for flammable materials found in the unholstered furniture shop.
  - Added the Safety Note.
- Unit 17 Tool and Equipment Identification and Use Moved from year 1 Old unit 12 for Furniture Upholstery Tools competencies added to this unit.
- Unit 18 Measurement moved from year 1.
- Unit 13 Furniture Padding, Hardware, and Support System Components Now Unit 19.
- Unit 14 furniture Frame Patterns and Layout II Now Unit 20.
- Unit 15: Cutting and Assembling Frames II Now Unit 21.
  - Removed 2.b. Assemble recliner frames.
- Unit 16: Computerized Numerical Control New Unit Now Unit 22.
- Unit 17: Measure, Layout, and Cut Fabrics II Now Unit 23.
  - Competency 2 – Changed Identify to Apply.
  - 2.d. added fabric to Observe automated fabric cutting equipment.
- Unit 18: Sewing Procedures II – edited 1.c. and 3.a.
  - Removed 3.b. content contained in a. after changes. Now Unit 24.
- Furniture Upholstery II Now Unit 25.
- Old Unit 19: removed - Special Topics in Furniture Manufacturing and Upholstery II.
- Industry Standards updated to reflect Changes.



### **2022 Automotive Service Technician**

- The automotive curriculum was directly aligned to the 2021 ASE Tasklist with written permission from ASE.
- The course outline and all unit names and content were changed to reflect the ASE Tasklist.
- The course outline hours were adjusted to reflect the needs of each ASE task within the perimeters of the state guidelines.
- The Industry Standards reflect the revisions made in the 2021 ASE Standards and Tasklist.





## 2022 Principles of Agriscience

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Acknowledgments

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The principles of agriscience curriculum is being presented to the Mississippi State Board of Education on November 12, 2021. The following persons were serving on the state board at the time:

Dr. Carey M. Wright, state superintendent of education  
Ms. Rosemary G. Aultman, Chair  
Mr. Glen East, Vice-Chair  
Dr. Wendi Barrett  
Dr. Angela Bass  
Dr. Karen J. Elam  
Mr. Bill Jacobs  
Dr. Ronnie McGehee  
Mr. Matt Miller  
Ms. Mary Werner  
Ms. Amy Zhang, student representative  
Ms. Micah Hill, student representative

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Wendy Clemons, the executive director of the MDE Office of Secondary Education and Professional Development, supported the RCU and teachers throughout the development of the framework and supporting materials.  
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Courtney McCubbins, a project manager with the RCU, researched and coauthored this framework. [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu)

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Chris Shivers, Region 8 regional manager for the Mississippi Farm Bureau Federation

Dr. OP McCubbins, assistant professor of agricultural education at MSU

Betsey Smith, the director of the RCU

Sam Watts, the curriculum manager for the RCU

# Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE principles of agriscience curriculum is aligned to the following standards:

## **National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards**

The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in Grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted by the National Council for Agricultural Education and are used with permission.

[thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr)

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oe/college-and-career-readiness-standards](http://mdek12.org/oe/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).



# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

Principles of agriscience is a one-Carnegie unit course that can be taught as an enhancement course or as the foundation course for the four-credit diversified agriculture program. All students must complete principles of agriscience before being allowed to enroll in the core and specialty courses of the program. The course serves as an introduction to the sciences, technologies, and applied practices of the progressive agriculture/agriscience industry. Emphasis is on an active learning environment enriched with technology- and science-based applications. The course focuses on providing an opportunity for students to explore the different fields of the agricultural sciences and develop foundational skills and knowledge needed for advancement in other courses and programs. Principles of agriscience is recommended for students in Grades 9 or 10. The course carries one Carnegie unit of credit that can count as a science elective credit for high school graduation.

## College, Career, and Certifications

No national industry-recognized certifications are known to exist at this time in the field of agriscience. Competencies and suggested performance indicators in the diversified agriculture courses have been correlated, however, to the *AFNR Career Cluster Content Standards* that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as ninth or 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
3. Instructor approval and TABE reading score (eighth grade or higher)  
**or**
  1. TABE reading and math score (eighth grade or higher)
  2. Instructor approval**or**
  1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

### **Applied Academic Credit**

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

### **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

### **Professional Learning**

If you have specific questions about the content of any of training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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This curriculum consists of a one 1-credit course.

## **Principles of Agriscience—Course Code: 991000**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Introduction to Agriscience	8
2	Lab Safety and the Scientific Method	8
3	Agricultural Leadership and Career Development	16
4	SAE for All	12
5	Tools in Agriscience	12
6	Environmental and Soil Science	20
7	Introduction to Cells and Genetics	8
8	Introduction to the Science of Agricultural Plants	20
9	Introduction to the Science of Agricultural Animals	20
10	Introduction to Agribusiness and Entrepreneurship	16
<b>Total</b>		<b>140</b>

# Career Pathway Outlook

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## Overview

The agricultural sciences career cluster covers the broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. According to the U.S. Department of Agriculture (USDA), through 2025, 59,400 jobs are expected to open in food, agriculture, renewable natural resources, or the environment for graduates with bachelor's or higher degrees in those areas. Almost half of those jobs will be in management and business at 42%; 31% in science, technology, engineering, and math (STEM) in agriculture; 13% in sustainable food and biomaterials production; and 14% in education, communication, and government services. According to the USDA, agriculture, food, and related industries contributed \$1.1 trillion to the U.S. gross domestic product (GDP) in 2019. The Mississippi Department of Agriculture and Commerce (MDAC) reports that agriculture is Mississippi's number one industry at \$7.4 billion and employing approximately 17.4% of the state's workforce.

Diversified agriculture will target careers at the professional and technical levels in agriculture. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college levels.

## Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (MDES) (2016). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Yearly Earnings, 2020
Agricultural and Food Science Technicians	260	270	10	3.9%	\$39,270
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	\$93,260
Animal Trainers	100	110	10	10%	\$23,120
Career/Technical Education Teachers, Middle School	320	350	30	9.4%	\$47,270
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	\$50,370
Conservation Scientists	700	730	30	4.3%	\$54,950
Environmental Engineers	410	420	10	2.4%	\$75,940
Environmental Engineering Technicians	160	170	10	6.3%	\$46,790
Environmental Scientists and Specialists, Including Health	620	670	50	8.1%	\$64,460

Environmental Science and Protection Technicians, Including Health	420	460	40	9.5%	\$38,780
Farm and Home Management Advisors	290	300	10	3.2%	\$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	\$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	\$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	\$24,030
Soil and Plant Scientists	110	110	0	0%	\$92,250
Farmers, Ranchers, and Other Agricultural Managers	1,790	1,840	20	2.8%	\$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2%	\$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	\$54,550
Fish and Game Wardens	40	40	0	0%	\$46,610
Foresters	190	200	10	5.3%	\$52,660
Surveyors	450	470	20	4.4%	\$48,600
Surveying and Mapping Technicians	530	550	20	3.8%	\$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	\$44,920
Veterinarians	490	540	50	10.2%	\$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1,090	120	12.4%	\$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	\$35,890
Zoologists and Wildlife Biologists	260	270	10	3.9%	\$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

### **Perkins V Requirements and Academic Infusion**

The principles of agriscience curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for careers in agriculture. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

### **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## Best Practices

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The diversified agriculture educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the diversified agriculture curriculum. FFA provides students with growth opportunities and competitive events and opens the doors to the world of agriculture and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The diversified agriculture curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the curriculum that will allow and encourage collaboration with professionals currently in the agriscience field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the diversified agriculture classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and agriscience professionals. Thus, supervised collaboration and immersion into the agriculture industry around the students are keys to students' success, knowledge, and skills development.



# Professional Organizations

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American Association for Agricultural Education (AAAE)

[aaaeonline.org](http://aaaeonline.org)

Association for Career and Technical Education (ACTE)

[acteonline.org](http://acteonline.org)

Mississippi ACTE

[mississippiacte.com](http://mississippiacte.com)

Mississippi FFA/ Mississippi Association of Vocational Agriculture Teachers (MAVAT)

[mississippiffa.org](http://mississippiffa.org)

National FFA Organization

[ffa.org](http://ffa.org)

National Association of Agricultural Educators (NAAE)

[naae.org](http://naae.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the principles of agriscience program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the principles of agriscience program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Introduction to Agriscience

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## Competencies and Suggested Objectives

1. Examine the impact of the agriculture and natural resources industry on society. <sup>DOK1</sup>
  - a. Investigate the scope of the agricultural and natural resources industry.
    - County
    - State
    - National
    - Global
  - b. Examine the history of agricultural practices and technologies utilized in animal and plant production.
  - c. Describe the major areas of agriculture and environmental science and technology.
    - Animal science
    - Plant science
    - Agricultural business
    - Environmental services
    - Food science
    - Agricultural mechanization and technology
    - Natural resources
    - Precision agriculture
2. Describe an application of science in agriculture and environmental science technology. <sup>DOK2</sup>
  - a. Describe basic and applied sciences that relate to agriscience.
  - b. Explore the impact of biotechnology on agriculture and environmental science.
    - Insulin (1922)
    - Discovery of DNA structure (1953)
    - Human Genome Project (1990)
    - Bt/Roundup Ready crops (1996)
    - Cloning (Dolly the sheep, 1996)
  - c. Examine current trends and technologies impacting modern agricultural and environmental practices.
  - d. Utilize the scientific method to design a research project on an area of study from within this course of study.

## Unit 2: Lab Safety and the Scientific Method

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### Competencies and Suggested Objectives

1. Analyze the basic rules of safety in the agriscience laboratory. <sup>DOK1</sup>
  - a. Discuss the safe and proper use of items found in an agriscience laboratory.
    - Chemicals
    - Heat and fire
    - Laboratory equipment
    - Specimens and animals
    - Electrical equipment
  - b. Explore Occupational Safety and Health Administration (OSHA) safety standards as they relate to the agricultural classroom, laboratory, and workplace.
  - c. Discuss the procedures for reporting an accident.
  - d. Illustrate the use of a Safety Data Sheet (SDS).
2. Demonstrate all safety equipment in the agriscience laboratory. <sup>DOK2</sup>
  - a. Identify the location of safety equipment and discuss procedures for dealing with accidents, injuries, and spills.
  - b. Describe general safety techniques using hand equipment and indicators.
    - Safety color codes
    - Fire extinguishers
    - First aid kits
    - Emergency exits
3. Practice safety concepts in laboratory activities. <sup>DOK2</sup>
  - a. Use appropriate precautions when working with electrical applications, fire, poisons, and gas.
  - b. Demonstrate the correct way to wear personal protective equipment (PPE).
  - c. Safely work with animals and plants.
  - d. Take steps to prevent a dangerous explosion.
4. Discuss terms associated with the scientific method and conduct an experiment. <sup>DOK3</sup>
  - a. Identify the problem or question to be answered.
  - b. Gather data related to the problem or question.
  - c. Formulate possible solutions.
  - d. Implement the preferred solutions.
  - e. Evaluate the results and pursue further research as needed.

**Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

**Note:** This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

## Unit 3: Agricultural Leadership and Career Development

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### Competencies and Suggested Objectives

1. Explore the integral relationship between the FFA and agricultural education. <sup>DOK1</sup>
  - a. Examine historical events that shaped school-based agricultural education.
    - Smith-Hughes Act (1917)
    - Establishment of the National FFA Organization (1928)
    - Mississippi FFA Association chartered (1934)
    - Establishment of the New Farmers of America (NFA) (1935)
    - Public Law 740 (1950)
    - Merger of the FFA and the NFA (1965)
    - Female membership (1969)
    - National FFA Organization name change (1988)
  - b. Identify types of FFA membership.
    - Active
    - Collegiate
    - Alumni
    - Honorary
  - c. Distinguish between the degree levels of FFA membership and describe the requirements for each.
    - Discovery FFA degree
    - Greenhand FFA degree
    - Chapter FFA degree
    - State FFA degree
    - American FFA degree
2. Explore the role of the FFA in promoting leadership, personal growth, and career success through 21st-century skills. <sup>DOK2</sup>
  - a. Explain the role of effective leadership.
  - b. Have students self-evaluate their personal leadership traits and develop a plan for improvement.
  - c. Identify and put into practice FFA activities that promote personal and career development, teamwork, and leadership skills.
    - Public speaking and communication skills
    - Career development events
    - Proficiency awards
    - Community service activities
    - Conventions and leadership conferences
  - d. Demonstrate basic parliamentary procedures.
    - Conducting a meeting
    - Stating a main motion

<ul style="list-style-type: none"> <li>• Voting on a motion</li> <li>• Understanding the use of the gavel</li> <li>• Distinguishing between types of motions (i.e., main, subsidiary, incidental, privileged)</li> </ul>
<p>3. Describe the role of 21st-century skills and concepts related to leadership when establishing and building a successful career. <sup>DOK2</sup></p> <p>a. Describe leadership.</p> <p>b. Describe the traits of a good leader.</p> <ul style="list-style-type: none"> <li>• Integrity</li> <li>• Knowledge</li> <li>• Courage</li> <li>• Tactfulness</li> <li>• Enthusiasm</li> <li>• Unselfishness</li> <li>• Loyalty</li> </ul> <p>c. Practice acceptable behaviors that are appropriate through FFA activities.</p> <ul style="list-style-type: none"> <li>• Introductions and greetings</li> <li>• Table manners</li> <li>• Expressing gratitude</li> <li>• Appropriate social media usage</li> </ul>
<p>4. Investigate careers associated with the agricultural industry. <sup>DOK1</sup></p> <p>a. Complete a project with details about a chosen career.</p> <ul style="list-style-type: none"> <li>• Description of the career</li> <li>• Educational/training requirements</li> <li>• Salary range</li> <li>• Job outlook</li> </ul>

## Unit 4: SAE for All

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### Competencies and Suggested Scenarios

1. Describe the purposes and requirements of the Supervised Agricultural Experience (SAE for All) program. <sup>DOK1</sup>
  - a. Establish objectives for the SAE program.
    - Personal growth
    - Career development
    - Responsible citizenship
    - Practical application of work experience and/or skill attainment
  - b. Determine the benefits of participation in an SAE program.
    - Assisting with career and personal choices
    - Applying business practices (e.g., record keeping, money management, etc.)
    - Nurturing individual talents and developing a cooperative attitude
    - Building character and encouraging citizenship and volunteerism
    - Providing an environment for practical learning
  - c. Describe the types of programs under SAE for All.
    - Explore concepts of a Foundational SAE.
      - Career exploration and planning
      - Employability skills for college and career readiness
      - Personal financial management and planning
      - Workplace safety
      - Agricultural literacy
    - Explore concepts of an Immersion SAE.
      - Placement/internship
      - Ownership/entrepreneurship
      - Research
        - Experimental
        - Analytical
        - Invention
      - School-based enterprise
      - Service learning
  - d. Explore the *Mississippi Work-Based Learning Teacher Resource Guide* as a companion to Immersion SAE.

- |   |
|---|
| <p>2. Launch a Foundational SAE plan. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Identify potential career interests.</li><li>b. Determine the availability of time and money/resources to invest.</li><li>c. Set short-range goals for the SAE program.</li><li>d. Project long-range goals for the SAE program.</li><li>e. Complete a training agreement for an SAE project.</li><li>f. Establish the requirements of student, parents, supervisor, and/or employer.</li></ul>  |
| <p>3. Develop a record-keeping system for an individual student's SAE program. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Determine the types of records to keep.<ul style="list-style-type: none"><li>• Hours worked/spent on a project or enterprise</li><li>• Inventory of assets</li><li>• Expenses</li><li>• Income</li><li>• Skills attained during a project or enterprise</li><li>• Leadership record</li><li>• Community service record</li><li>• Journal of experiences</li><li>• Pictures</li></ul></li><li>b. Maintain records using an electronic/computer-based system of record keeping for the SAE program.</li></ul> |



## Unit 5: Tools in Agriscience

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### Competencies and Suggested Objectives

1. Identify commonly used tools and measuring devices in agriscience. <sup>DOK1</sup>
  - a. Identify basic hand and power tools used in agriscience per the Mississippi FFA Tool Identification list.
  - b. Discuss and demonstrate the proper use of precision measuring devices to determine mass, weight, and volume.
    - Balance
    - Scale
    - Graduated cylinder
    - Standard measuring devices
      - Rulers
      - Tape measures
      - Micrometers
      - Dividers
      - Protractors
2. Apply proper hand- and power-tool operational procedures. <sup>DOK2</sup>
  - a. Demonstrate how to use hand and power tools.
    - Hammers (e.g., claw, ball peen)
    - Screwdrivers (e.g., Phillips, standard)
    - Tape measures
    - Saws (e.g., hand, coping, miter)
    - Drills
    - Assorted power tools (as applicable)

## Unit 6: Environmental and Soil Science

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<b>Competencies and Suggested Objectives</b>	
1. Define the terms associated with alternative and sustainable energy. <sup>DOK1</sup>	
a. Define terms.	
• Renewable	
• Nonrenewable	
• Fossil fuels	
• Conservation	
• Preservation	
2. Define terms related to environmental resources, including air, water, and soil. <sup>DOK1</sup>	
3. Discuss the composition of air, water, and soil. <sup>DOK1</sup>	
a. Investigate the factors affecting air quality.	
b. Investigate the factors affecting water quality.	
c. Investigate the factors affecting soil quality.	
4. Describe soil and discuss the importance it plays in agricultural production. <sup>DOK1</sup>	
5. Identify and describe the physical composition of soil, including air, water, organic matter, and mineral matter (e.g., sand, silt, clay, etc.). <sup>DOK1</sup>	
6. Identify and describe the physical properties of soil. <sup>DOK1</sup>	
a. Describe the characteristics of various types of soil texture (e.g., sand, silt, clay, etc.).	
b. Describe the physical structure of soil.	
c. Discuss factors that influence the color of soil (e.g., mineral content, water, parent material).	
7. Demonstrate how to use the USDA Textural Triangle to classify soil texture. <sup>DOK2</sup>	
8. List the factors that impact soil formation. <sup>DOK1</sup>	
a. List the factors.	
• Parent materials	
• Climate	
• Living organisms	
• Time	
• Topography	
9. Describe a soil horizon and the horizons/layers of a typical soil profile, including O, A, B, C, and R. <sup>DOK1</sup>	
10. Explore the basic concepts of natural resource conservation and management. <sup>DOK1</sup>	
a. Compare and contrast renewable and nonrenewable natural resources.	
b. Discuss the importance of stewardship and sustainability as related to natural resources and the environment.	

## Unit 7: Introduction to Cells and Genetics

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### Competencies and Suggested Objectives

1. Diagram the major components of an animal and plant cell and list their functions. <sup>DOK1</sup>
  - a. Diagram components of animal and plant cells.
    - Cell membrane
    - Cytoplasm
    - Endoplasmic reticulum
    - Golgi apparatus
    - Mitochondrion
    - Nucleus
    - Nucleolus
    - Ribosomes
    - Vacuoles
2. Explain animal growth and reproduction by cell mitosis and meiosis. <sup>DOK1</sup>
3. Define and explain basic concepts of heredity and genetics. <sup>DOK1</sup>
  - a. Define terms.
    - Genetics
    - Heredity
    - Genes
    - Homogeneous
    - Heterogeneous
    - Dominant
    - Recessive

# Unit 8: Introduction to the Science of Agricultural Plants

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<b>Competencies and Suggested Objectives</b>
<p>1. Explore the physiology of plants. <sup>DOK1</sup></p> <ol style="list-style-type: none"><li>Compare the physiological processes of respiration, photosynthesis, and transpiration as they affect plant growth.</li><li>Examine the process of plant growth, including cell division, cell elongation, and cell differentiation.</li></ol>
<p>2. Investigate plant anatomy. <sup>DOK1</sup></p> <ol style="list-style-type: none"><li>Draw and label a diagram of the anatomy of a flowering plant.<ul style="list-style-type: none"><li>Roots</li><li>Stem</li><li>Leaf</li><li>Flower</li></ul></li><li>Describe the root systems of plants, including diagrams or drawings of the types of root systems, the structure of roots, and the function of roots on a plant.<ul style="list-style-type: none"><li>Type (e.g., fibrous, taproot)</li><li>Structure (e.g., root cap, root hair)</li><li>Function (e.g., anchor the plant)</li></ul></li><li>Describe plant stems, including diagrams or drawings of the types of stems found on plants, the structure of stems, and the function of stems on plants.<ul style="list-style-type: none"><li>Type (e.g., woody, herbaceous)</li><li>Structures (e.g., xylem, phloem, lateral bud, terminal bud)</li><li>Function (e.g., transport water and nutrients)</li></ul></li><li>Describe plant leaves, including their function, diagrams or drawings of leaf structures, and the various types of leaves found on plants.<ul style="list-style-type: none"><li>Types (e.g., monocot, dicot, broadleaf, narrowleaf)</li><li>Function (e.g., photosynthesis)</li></ul></li><li>Describe plant flowers, including their function, diagrams or drawings of flower parts, and a description of the various types of flowers found on plants.<ul style="list-style-type: none"><li>Types (e.g., complete, incomplete)</li><li>Structures (e.g., pistil, stamen, sepal, petal)</li><li>Function (e.g., seed production, reproduction)</li></ul></li></ol>
<p>3. Investigate common methods of plant reproduction. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>Compare and contrast sexual and asexual reproduction in plants.</li><li>Examine the process of seed formation, including pollination and fertilization in sexual reproduction.</li><li>Compare dicotyledonous and monocotyledonous seeds.</li></ol>

<p>d. Identify the parts of a seed and associate each part with its function.</p> <ul style="list-style-type: none"> <li>• Epicotyl</li> <li>• Hypocotyl</li> <li>• Cotyledon</li> <li>• Seed coat</li> <li>• Endosperm</li> <li>• Radicle</li> </ul> <p>e. Dissect a monocot and a dicot seed and describe the differences between the two.</p> <p>f. Describe and apply factors essential to seed germination.</p> <ul style="list-style-type: none"> <li>• Water</li> <li>• Light</li> <li>• Temperature</li> <li>• Air</li> </ul> <p>g. Conduct a simple germination test on a packet of seeds including calculating the percentage of seeds that germinate and determine a germination ratio.</p> <p>h. Describe the methods of asexual reproduction in plants.</p> <ul style="list-style-type: none"> <li>• Cuttings</li> <li>• Grafting</li> <li>• Layering</li> <li>• Separation and division</li> <li>• Tissue culture/micropropagation</li> </ul>
<p>4. Discuss classification methods for plants. <sup>DOK1</sup></p> <p>a. Identify and describe the basic life cycles of a plant, including annual, biennial, and perennial.</p> <p>b. Describe the use of scientific classification systems in plant science, with an emphasis on the use of the genus, species, variety, and cultivar in plant names.</p>

## Unit 9: Introduction to the Science of Agricultural Animals

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<b>Competencies and Suggested Objectives</b>	
1. Explore common terminology associated with the agricultural animal industry. <sup>DOK1</sup>	
a. Identify the terms associated by species and stage of life.	<ul style="list-style-type: none"><li>• Cattle (e.g., bull, calf, heifer, steer, cow)</li><li>• Sheep (e.g., lamb, ewe, ram, wether)</li><li>• Swine (e.g., piglet, gilt, sow, boar, barrow)</li><li>• Goats (e.g., kid, doe, buck, wether)</li><li>• Horses (e.g., foal, colt, filly, mare, stallion, gelding)</li><li>• Chickens (e.g., chick, hen, rooster, pullet, capon, cockerel)</li><li>• Fish (e.g., fry, fingerling, adult)</li></ul>
b. Describe types and breeds of livestock relevant to the local area.	
2. Investigate the anatomy and physiology of animals. <sup>DOK1</sup>	
a. Identify the basic body systems and their functions.	<ul style="list-style-type: none"><li>• Skeletal</li><li>• Muscular</li><li>• Nervous</li><li>• Respiratory</li><li>• Circulatory</li><li>• Reproductive</li><li>• Digestive</li><li>• Urinary</li><li>• Endocrine</li></ul>
3. Describe important elements of digestion and nutrition in animals. <sup>DOK2</sup>	
a. Associate each of the six major classes of nutrients with its roles and functions.	<ul style="list-style-type: none"><li>• Proteins</li><li>• Carbohydrates</li><li>• Vitamins</li><li>• Fats</li><li>• Water</li><li>• Minerals</li></ul>
b. Compare and contrast the digestive systems and processes in monogastric, ruminant, pseudo-ruminant, modified monogastric (avian), and catfish.	
c. Discuss the use of roughages and concentrates as feedstuffs.	
4. Examine the role of genetics and breeding in animal production. <sup>DOK2</sup>	
a. Identify and explain the reproduction process in mammals, poultry, and catfish.	
b. Define and describe breeding processes, including natural mating, artificial insemination, and embryo transfer.	

# Unit 10: Introduction to Agribusiness and Entrepreneurship

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## Competencies and Suggested Objectives

1. Explore the concept of agribusiness and its role in the economy. <sup>DOK1</sup>
  - a. Explain agribusiness.
  - b. Define terms related to agribusiness.
    - Capital
    - Budgets
    - Assets
    - Liabilities
    - Income
    - Expenses
  - c. Describe how agribusiness influences the economy.
  - d. Describe how agribusiness principles fit into the agricultural industry as farmers input supplies into production agriculture, and agricultural services take the output to get the product to the consumer (i.e., farm-to-table concept).
  - e. Identify local and statewide agribusinesses.
  - f. Explore opportunities and challenges of e-commerce.
2. Examine the principles of business organizations in agriculture. <sup>DOK1</sup>
  - a. Compare the characteristics of the most commonly used business organizations in the agriculture and natural resources industry (e.g., proprietorships, partnerships, corporations, cooperatives).

# Student Competency Profile

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Student's Name: \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Introduction to Agriscience</b>		
	1.	Examine the impact of the agriculture and natural resources industry on society.
	2.	Describe an application of science in agriculture and environmental science technology.
<b>Unit 2: Lab Safety and the Scientific Method</b>		
	1.	Analyze the basic rules of safety in the agriscience laboratory.
	2.	Demonstrate all safety equipment in the agriscience laboratory.
	3.	Practice safety concepts in laboratory activities.
	4.	Discuss terms associated with the scientific method and conduct an experiment.
<b>Unit 3: Agricultural Leadership and Career Development</b>		
	1.	Explore the integral relationship between the FFA and agricultural education.
	2.	Explore the role of the FFA in promoting leadership, personal growth, and career success through 21st-century skills.
	3.	Describe the role of 21st-century skills and concepts related to leadership when establishing and building a successful career.
	4.	Investigate careers associated with the agricultural industry.
<b>Unit 4: SAE for All</b>		
	1.	Describe the purposes and requirements of the Supervised Agricultural Experience (SAE For All) program.
	2.	Launch a Foundational SAE plan.
	3.	Develop a record-keeping system for an individual student's SAE program.
<b>Unit 5: Tools in Agriscience</b>		
	1.	Identify commonly used tools and measuring devices in agriscience.
	2.	Apply proper hand- and power-tool operational procedures.



<b>Unit 6: Environmental and Soil Science</b>		
	1.	Define the terms associated with alternative and sustainable energy.
	2.	Define terms related to environmental resources, including air, water, and soil.
	3.	Discuss the composition of air, water, and soil.
	4.	Describe soil and discuss the importance it plays in agricultural production.
	5.	Identify and describe the physical composition of soil, including air, water, organic matter and mineral matter (e.g., sand, silt, clay, etc.).
	6.	Identify and describe the physical properties of soil.
	7.	Demonstrate how to use the USDA Textural Triangle to classify soil texture.
	8.	List the factors that impact soil formation.
	9.	Describe a soil horizon and the horizons/layers of a typical soil profile, including O, A, B, C, and R.
	10.	Explore the basic concepts of natural resource conservation and management.
<b>Unit 7: Introduction to Cells and Genetics</b>		
	1.	Diagram the major components of an animal and plant cell and list their functions.
	2.	Explain animal growth and reproduction by cell mitosis and meiosis.
	3.	Define and explain basic concepts of heredity and genetics.
<b>Unit 8: Introduction to the Science of Agricultural Plants</b>		
	1.	Explore the physiology of plants.
	2.	Investigate plant anatomy.
	3.	Investigate common methods of plant reproduction.
	4.	Discuss classification methods for plants.
<b>Unit 9: Introduction to the Science of Agricultural Animals</b>		
	1.	Explore common terminology associated with the agricultural animal industry.
	2.	Investigate the anatomy and physiology of animals.
	3.	Describe important elements of digestion and nutrition in animals.
	4.	Examine the role of genetics and breeding in animal production.
<b>Unit 10: Introduction to Agribusiness and Entrepreneurship</b>		
	1.	Explore the concept of agribusiness and its role in the economy.
	2.	Examine the principles of business organizations in agriculture.

## Appendix: Industry Standards

### Framework for AFNR Content Standards and Performance Elements Crosswalk for Principles of Agriscience

	Unit	1	2	3	4	5	6	7	8	9	10
AFNR											
ABS- Agribusiness Systems		X		X	X						X
AS- Animal Systems		X	X					X		X	
BS- Biotechnology		X	X								
CRP- Career Ready Practices		X	X	X	X	X	X	X	X	X	X
CS- AFNR Cluster Skill		X	X	X	X						
ES- Environmental Service Systems		X	X				X				
FPP- Food Products and Processing Systems		X									
NRS- Natural Resource Systems		X	X				X				
PS- Plant Systems		X	X					X	X		
PST- Power, Structural, and Technical Systems		X	X			X					

### AFNR Pathway Content Standards and Performance Elements

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**ABS AGRIBUSINESS SYSTEMS**  
**AS ANIMAL SYSTEMS**  
**BS BIOTECHNOLOGY**  
**CRP CAREER READY PRACTICES**  
**CS AGRICULTURE FOOD AND NATURAL RESOURCES CLUSTER SKILL**  
**ES ENVIRONMENTAL SERVICE SYSTEMS**  
**FPP FOOD PRODUCTS AND PROCESSING SYSTEMS**  
**NRS NATURAL RESOURCE SYSTEMS**  
**PS PLANT SYSTEMS**  
**PST POWER, STRUCTURAL, AND TECHNICAL SYSTEMS**

## Agribusiness Systems Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), and business planning, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agribusiness Systems (AG-ABS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ABS.01. CCTC Standard:** Apply management planning principles in AFNR businesses.

**ABS.01.01. Performance Indicator:** Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.

**ABS.01.02. Performance Indicator:** Read, interpret, evaluate and write statements of purpose to guide business goals, objectives and resource allocation.

**ABS.01.03. Performance Indicator:** Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.

**ABS.01.04. Performance Indicator:** Evaluate, develop and implement procedures used to recruit, train and retain productive human resources for AFNR businesses.

**ABS.02. CCTC Standard:** Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

**ABS.02.01. Performance Indicator:** Apply fundamental accounting principles, systems, tools and applicable laws and regulations to record, track and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

**ABS.02.02. Performance Indicator:** Assemble, interpret and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash-flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

**ABS.03. CCTC Standard:** Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

**ABS.03.01. Performance Indicator:** Develop, assess and manage cash budgets to achieve AFNR business goals.

**ABS.03.02. Performance Indicator:** Analyze credit needs and manage credit budgets to achieve AFNR business goals.

**ABS.04. CCTC Standard:** Develop a business plan for an AFNR business.

**ABS.04.01. Performance Indicator:** Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

**ABS.04.02. Performance Indicator:** Develop production and operational plans for an AFNR business.

**ABS.04.03. Performance Indicator:** Identify and apply strategies to manage or mitigate risk.

**ABS.05. CCTC Standard:** Use sales and marketing principles to accomplish AFNR business objectives.

**ABS.05.01. Performance Indicator:** Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.

**ABS.05.02. Performance Indicator:** Assess and apply sales principles and skills to accomplish AFNR business objectives.

**ABS.05.03. Performance Indicator:** Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

## Animal Systems Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, and management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Animal Systems (AG-AS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**AS.01. CCTC Standard:** Analyze historic and current trends impacting the animal systems industry.

**AS.01.01. Performance Indicator:** Evaluate the development and implications of animal origin, domestication and distribution on production practices and the environment.

**AS.01.02. Performance Indicator:** Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.

- AS.01.03. Performance Indicator:** Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.
- AS.02. CCTC Standard:** Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.
- AS.02.01. Performance Indicator:** Demonstrate management techniques that ensure animal welfare.
- AS.02.02. Performance Indicator:** Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).
- AS.03. CCTC Standard:** Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.
- AS.03.01. Performance Indicator:** Analyze the nutritional needs of animals.
- AS.03.02 Performance Indicator:** Analyze feed rations and assess if they meet the nutritional needs of animals.
- AS.03.03 Performance Indicator:** Utilize industry tools to make animal nutrition decisions.
- AS.04. CCTC Standard:** Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.
- AS.04.01. Performance Indicator:** Evaluate animals for breeding readiness and soundness.
- AS.04.02. Performance Indicator:** Apply scientific principles to select and care for breeding animals.
- AS.04.03 Performance Indicator:** Apply scientific principles to breed animals.
- AS.05. CCTC Standard:** Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.
- AS.05.01. Performance Indicator:** Design animal housing, equipment and handling facilities for the major systems of animal production.
- AS.05.02. Performance Indicator:** Comply with government regulations and safety standards for facilities used in animal production.
- AS.06. CCTC Standard:** Classify, evaluate and select animals based on anatomical and physiological characteristics.
- AS.06.01. Performance Indicator:** Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).
- AS.06.02. Performance Indicator:** Apply principles of comparative anatomy and physiology to uses within various animal systems.
- AS.06.03. Performance Indicator:** Select and train animals for specific purposes and maximum performance based on anatomy and physiology.
- AS.07. CCTC Standard:** Apply principles of effective animal health care.
- AS.07.01. Performance Indicator:** Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

**AS.07.02. Performance Indicator:** Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

**AS.08. CCTC Standard:** Analyze environmental factors associated with animal production.

**AS.08.01. Performance Indicator:** Design and implement methods to reduce the effects of animal production on the environment.

**AS.08.02. Performance Indicator:** Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

## Common Career Technical Core Career Ready Practices Content Standards

The CCTC CRPs encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical-thinking, problem solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

**DEFINITIONS:** Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for CRPs from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a CTE program of study.

**CRP.01. CCTC Standard:** Act as a responsible and contributing citizen and employee.

**CRP.01.01. Performance Indicator:** Model personal responsibility in the workplace and community.

**CRP.01.02 Performance Indicator:** Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.

**CRP.01.03. Performance Indicator:** Identify and act upon opportunities for professional and civic service at work and in the community.

**CRP.02. CCTC Standard:** Apply appropriate academic and technical skills.

**CRP.02.01. Performance Indicator:** Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

**CRP.02.02. Performance Indicator:** Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

**CRP.03. CCTC Standard:** Attend to personal health and financial well-being.

**CRP.03.01. Performance Indicator:** Design and implement a personal wellness plan.

**CRP.03.02. Performance Indicator:** Design and implement a personal financial management plan.

**CRP.04. CCTC Standard:** Communicate clearly, effectively and with reason.

**CRP.04.01. Performance Indicator:** Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

**CRP.04.02. Performance Indicator:** Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

**CRP.04.03. Performance Indicator:** Model active listening strategies when interacting with others in formal and informal settings.

**CRP.05. CCTC Standard:** Consider the environmental, social and economic impacts of decisions.

**CRP.05.01. Performance Indicator:** Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.

**CRP.05.02. Performance Indicator:** Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

**CRP.06. CCTC Standard:** Demonstrate creativity and innovation.

**CRP.06.01. Performance Indicator:** Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

**CRP.06.02. Performance Indicator:** Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

**CRP.06.03. Performance Indicator:** Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

**CRP.07. CCTC Standard:** Employ valid and reliable research strategies.

**CRP.07.01. Performance Indicator:** Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

**CRP.07.02. Performance Indicator:** Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

**CRP.08. CCTC Standard:** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP.08.01. Performance Indicator:** Apply reason and logic to evaluate workplace and community situations from multiple perspectives.

**CRP.08.02. Performance Indicator:** Investigate, prioritize and select solutions to solve problems in the workplace and community.

**CRP.08.03. Performance Indicator:** Establish plans to solve workplace and community problems and execute them with resiliency.

**CRP.09. CCTC Standard:** Model integrity, ethical leadership and effective management.

**CRP.09.01. Performance Indicator:** Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

**CRP.09.02. Performance Indicator:** Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

**CRP.09.03. Performance Indicator:** Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

**CRP.10. CCTC Standard:** Plan education and career path aligned to personal goals.

**CRP.10.01. Performance Indicator:** Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

**CRP.10.02. Performance Indicator:** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

**CRP.10.03. Performance Indicator:** Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

**CRP.10.04. Performance Indicator:** Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

**CRP.11. CCTC Standard:** Use technology to enhance productivity.

**CRP.11.01. Performance Indicator:** Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

**CRP.11.02. Performance Indicator:** Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.

**CRP.12. CCTC Standard:** Work productively in teams while using cultural/global competence.

**CRP.12.01. Performance Indicator:** Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

**CRP.12.02. Performance Indicator:** Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

## **Agriculture, Food, and Natural Resources Cluster Skill Content Standards**

The AFNR Cluster Skills (CS) encompasses the study of fundamental knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career



pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agriculture, Food and Natural Resources Career Cluster® (AG) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**CS.01. CCTC Standard:** Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

**CS.01.01. Performance Indicator:** Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

**CS.01.02. Performance Indicator:** Examine technologies and analyze their impact on AFNR systems.

**CS.01.03. Performance Indicator:** Identify public policies and examine their impact on AFNR systems.

**CS.02. CCTC Standard:** Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

**CS.02.01. Performance Indicator:** Research and use geographic and economic data to solve problems in AFNR systems.

**CS.02.02. Performance Indicator:** Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

**CS.03. CCTC Standard:** Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

**CS.03.01. Performance Indicator:** Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.

**CS.03.02. Performance Indicator:** Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

**CS.03.03. Performance Indicator:** Apply health and safety practices to AFNR workplaces.

**CS.03.04. Performance Indicator:** Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

- CS.04. CCTC Standard:** Demonstrate stewardship of natural resources in AFNR activities.
- CS.04.01. Performance Indicator:** Identify and implement practices to steward natural resources in different AFNR systems.
- CS.04.02. Performance Indicator:** Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.
- CS.05. CCTC Standard:** Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
- CS.05.01. Performance Indicator:** Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).
- CS.06. CCTC Standard:** Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.
- CS.06.01. Performance Indicator:** Examine and explain foundational cycles and systems of AFNR.
- CS.06.02. Performance Indicator:** Analyze and explain the connection and relationships between different AFNR systems on a national and global level.

## Biotechnology Systems Career Pathway Content Standards

The Biotechnology Systems (BS) Career Pathway encompasses the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- **National Council for Agricultural Education (NCAE) Standard\*** – These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying biotechnology to AFNR systems.
  - **Performance Indicators** – These statements distill each performance element into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related performance element at the conclusion of a program of study in this area.
- BS.01. NCAE Standard:** Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).
- BS.01.01. Performance Indicator:** Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).

**BS.01.02. Performance Indicator:** Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).

**BS.01.03. Performance Indicator:** Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

**BS.02. NCAE Standard:** Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

**BS.02.01. Performance Indicator:** Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.

**BS.02.02. Performance Indicator:** Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.

**BS.02.03. Performance Indicator:** Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

**BS.02.04. Performance Indicator:** Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

**BS.02.05. Performance Indicator:** Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

**BS.03. NCAE Standard:** Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

**BS.03.01. Performance Indicator:** Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

**BS.03.02. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

**BS.03.03. Performance Indicator:** Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

**BS.03.04. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

**BS.03.05. Performance Indicator:** Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).

**BS.03.06. Performance Indicator:** Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

## Environmental Service Systems Career Pathway Content Standards

The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Environmental Service Systems (AG-ESS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ESS.01. CCTC Standard:** Use analytical procedures and instruments to manage environmental service systems.

**ESS.01.01. Performance Indicator:** Analyze and interpret laboratory and field samples in environmental service systems.

**ESS.01.02. Performance Indicator:** Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

**ESS.02. CCTC Standard:** Evaluate the impact of public policies and regulations on environmental service system operations.

**ESS.02.01. Performance Indicator:** Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.

**ESS.02.02. Performance Indicator:** Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).

**ESS.02.03. Performance Indicator:** Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

**ESS.03. CCTC Standard:** Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

**ESS.03.01. Performance Indicator:** Apply meteorology principles to environmental service systems.

**ESS.03.02. Performance Indicator:** Apply soil science and hydrology principles to environmental service systems.

**ESS.03.03. Performance Indicator:** Apply chemistry principles to environmental service systems.

**ESS.03.04. Performance Indicator:** Apply microbiology principles to environmental service systems.

**ESS.03.05. Performance Indicator:** Apply ecology principles to environmental service systems.

**ESS.04. CCTC Standard:** Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

**ESS.04.01. Performance Indicator:** Use pollution control measures to maintain a safe facility and environment.

**ESS.04.02. Performance Indicator:** Manage safe disposal of all categories of solid waste in environmental service systems.

**ESS.04.03. Performance Indicator:** Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

**ESS.04.04. Performance Indicator:** Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.

**ESS.05. CCTC Standard:** Use tools, equipment, machinery and technology common to tasks in environmental service systems.

**ESS.05.01. Performance Indicator:** Use technological and mathematical tools to map land, facilities and infrastructure for environmental service systems.

**ESS.05.02. Performance Indicator:** Perform assessments of environmental conditions using equipment, machinery and technology.

## **Food Products and Processing Systems Career Pathway Content Standards**

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety and sanitation; nutrition, biology, microbiology, chemistry and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Food Products and Processing Systems (AG-FPP) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to

demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**FPP.01. CCTC Standard:** Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

**FPP.01.01. Performance Indicator:** Analyze and manage operational and safety procedures in food products and processing facilities.

**FPP.01.02. Performance Indicator:** Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

**FPP.01.03. Performance Indicator:** Apply food safety procedures when storing food products to ensure food quality.

**FPP.02. CCTC Standard:** Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

**FPP.02.01. Performance Indicator:** Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.02. Performance Indicator:** Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.03. Performance Indicator:** Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.03. CCTC Standard:** Select and process food products for storage, distribution and consumption.

**FPP.03.01. Performance Indicator:** Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

**FPP.03.02. Performance Indicator:** Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

**FPP.03.03. Performance Indicator:** Create food distribution plans and procedures to ensure safe delivery of food products.

**FPP.04. CCTC Standard:** Explain the scope of the food industry and the historical and current developments of food product and processing.

**FPP.04.01. Performance Indicator:** Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

**FPP.04.02. Performance Indicator:** Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

**FPP.04.03. Performance Indicator:** Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

## Natural Resource Systems Career Pathway Content Standards

The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of natural resource systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Natural Resource Systems (AG-NRS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**NRS.01. CCTC Standard:** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

**NRS.01.01. Performance Indicator:** Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.

**NRS.01.02. Performance Indicator:** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.

**NRS.01.03. Performance Indicator:** Apply ecological concepts and principles to atmospheric natural resource systems.

**NRS.01.04. Performance Indicator:** Apply ecological concepts and principles to aquatic natural resource systems.

**NRS.01.05. Performance Indicator:** Apply ecological concepts and principles to terrestrial natural resource systems.

**NRS.01.06. Performance Indicator:** Apply ecological concepts and principles to living organisms in natural resource systems.

**NRS.02. CCTC Standard:** Analyze the interrelationships between natural resources and humans.

**NRS.02.01. Performance Indicator:** Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).

**NRS.02.02. Performance Indicator:** Assess the impact of human activities on the availability of natural resources.

**NRS.02.03. Performance Indicator:** Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.

**NRS.02.04. Performance Indicator:** Examine and explain how economics affects the use of natural resources.

**NRS.02.05. Performance Indicator:** Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

**NRS.03. CCTC Standard:** Develop plans to ensure sustainable production and processing of natural resources.

**NRS.03.01. Performance Indicator:** Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

**NRS.03.02. Performance Indicator:** Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

**NRS.04. CCTC Standard:** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

**NRS.04.01. Performance Indicator:** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

**NRS.04.02. Performance Indicator:** Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

**NRS.04.03. Performance Indicator:** Prevent or manage introduction of ecologically harmful species in a particular region.

**NRS.04.04. Performance Indicator:** Manage fires in natural resource systems.

## Plant Science Systems Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Plant Systems (AG-PS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.



- PS.01. CCTC Standard:** Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- PS.01.01. Performance Indicator:** Determine the influence of environmental factors on plant growth.
- PS.01.02. Performance Indicator:** Prepare and manage growing media for use in plant systems.
- PS.01.03. Performance Indicator:** Develop and implement a fertilization plan for specific plants or crops.
- PS.02. CCTC Standard:** Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.01. Performance Indicator:** Classify plants according to taxonomic systems.
- PS.02.02. Performance Indicator:** Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Performance Indicator:** Apply knowledge of plant physiology and energy conversion to plant systems.
- PS.03. CCTC Standard:** Propagate, culture and harvest plants and plant products based on current industry standards.
- PS.03.01. Performance Indicator:** Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Performance Indicator:** Develop and implement a management plan for plant production.
- PS.03.03. Performance Indicator:** Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Performance Indicator:** Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Performance Indicator:** Harvest, handle and store crops according to current industry standards.
- PS.04. CCTC Standard:** Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- PS.04.01. Performance Indicator:** Evaluating, identifying and preparing plants to enhance an environment.
- PS.04.02. Performance Indicator:** Create designs using plants.

## Power, Structural and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Power, Structural and Technical Systems (AG-PST) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**PST.01. CCTC Standard:** Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

**PST.01.01. Performance Indicator:** Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.

**PST.01.02. Performance Indicator:** Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.

**PST.01.03. Performance Indicator:** Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).

**PST.02. CCTC Standard:** Operate and maintain AFNR mechanical equipment and power systems.

**PST.02.01. Performance Indicator:** Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.

**PST.02.02. Performance Indicator:** Operate machinery and equipment while observing all safety precautions in AFNR settings.

**PST.03. CCTC Standard:** Service and repair AFNR mechanical equipment and power systems.

**PST.03.01. Performance Indicator:** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.

**PST.03.02. Performance Indicator:** Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.

**PST.03.03. Performance Indicator:** Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

**PST.04. CCTC Standard:** Plan, build and maintain AFNR structures.

**PST.04.01. Performance Indicator:** Create sketches and plans for AFNR structures.

**PST.04.02. Performance Indicator:** Determine structural requirements, specifications and estimate costs for AFNR structures

**PST.04.03. Performance Indicator:** Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).

**PST.04.04. Performance Indicator:** Apply electrical wiring principles in AFNR structures.

**PST.05. CCTC Standard:** Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.

**PST.05.01. Performance Indicator:** Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

**PST.05.02. Performance Indicator:** Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.

**PST.05.03. Performance Indicator:** Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.





## 2022 Diversified Agriculture Mechanization Core

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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## Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE diversified agriculture mechanization core curriculum is aligned to the following standards:

### **National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards**

The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in Grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted to the National Council for Agricultural Education and are used by permission.

[thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr)

### **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

### **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oea/college-and-career-readiness-standards](http://mdek12.org/oea/college-and-career-readiness-standards)

### **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).



[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

The diversified agriculture mechanization core curriculum is a one-Carnegie unit course within the diversified agriculture pathway. All students must successfully complete the principles of agriscience prerequisite course before being allowed to enroll in the diversified agriculture mechanization core course. Emphasis in this pathway is centered on teaching advanced skills in mechanization as they apply to various aspects of an agricultural work environment. Students will attain advanced knowledge and skills in areas such as electricity, welding and fabrication, hydraulics and pneumatics, and the management and operation of agricultural equipment. Focus is on an active learning environment enriched with technology, engineering, and math-based applications.

## College, Career, and Certifications

No national industry-recognized certifications are known to exist at this time in the field of agriculture mechanization. Competencies and suggested performance indicators in this course have been correlated, however, to the AFNR Career Cluster Content Standards that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
3. Instructor approval and TABE reading score (eighth grade or higher)

**or**

1. TABE reading and math score (eighth grade or higher)
2. Instructor approval

**or**

1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Applied Academic Credit

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

### **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

### **Professional Learning**

If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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This curriculum consists of one 1-credit course.

## **Diversified Agriculture Mechanization Core—Course Code: 991004**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Leadership and SAE for All	5
2	Introduction to Agricultural Mechanization	10
3	Safety Applications in Agricultural Mechanization	10
4	Principles of Welding	20
5	Oxyfuel Cutting and Welding and Plasma-Cutting Operations	20
6	Hydraulic and Pneumatic Systems in Agriculture	10
7	Electrical Systems Applications in Agriculture	10
8	Principles of Engines	30
9	Management and Operation of Agricultural Equipment	25
<b>Total</b>		<b>140</b>

# Career Pathway Outlook

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## Overview

The agricultural sciences career cluster covers the broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. According to the U.S. Department of Agriculture, during the next five years (2020-2025) 59,400 jobs are expected to open in food, agriculture, renewable natural resources, or the environment for graduates with bachelor's or higher degrees in those areas. Almost half of those jobs will be in management and business at 42%; 31% in science, technology, engineering, and math in agriculture; 13% in sustainable food and biomaterials production; and 14% in education, communication, and government services. According to USDA, agriculture, food, and related industries contributed \$1.109 trillion to the U.S. gross domestic product (GDP) in 2019. The Mississippi Department of Agriculture and Commerce reports that agriculture is Mississippi's number one industry at \$7.35 billion and employing approximately 17.4% of the state's workforce.

Diversified agriculture will target careers at the professional and technical levels in agriculture. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college levels.

## Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (2016). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Yearly Earnings, 2020
Agricultural and Food Science Technicians	260	270	10	3.9%	\$39,270
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	\$93,260
Animal Trainers	100	110	10	10%	\$23,120
Career/Technical Education Teachers, Middle School	320	350	30	9.4%	\$47,270
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	\$50,370
Conservation Scientists	700	730	30	4.3%	\$54,950
Environmental Engineers	410	420	10	2.4%	\$75,940
Environmental Engineering Technicians	160	170	10	6.3%	\$46,790
Environmental Scientists and Specialists, Including Health	620	670	50	8.1%	\$64,460

Environmental Science and Protection Technicians, Including Health	420	460	40	9.5%	\$38,780
Farm and Home Management Advisors	290	300	10	3.2%	\$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	\$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	\$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	\$24,030
Soil and Plant Scientists	110	110	0	0%	\$92,250
Farmers, Ranchers, and Other Agricultural Managers	1,790	1,840	20	2.8%	\$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2%	\$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	\$54,550
Fish and Game Wardens	40	40	0	0%	\$46,610
Foresters	190	200	10	5.3%	\$52,660
Surveyors	450	470	20	4.4%	\$48,600
Surveying and Mapping Technicians	530	550	20	3.8%	\$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	\$44,920
Veterinarians	490	540	50	10.2%	\$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1,090	120	12.4%	\$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	\$35,890
Zoologists and Wildlife Biologists	260	270	10	3.9%	\$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).



### **Perkins V Requirements and Academic Infusion**

The diversified agriculture mechanization core curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for careers in agriculture. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

### **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## Best Practices

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The diversified agriculture educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the diversified agriculture curriculum. FFA provides students with growth opportunities and competitive events and opens the doors to the world of agriculture and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The diversified agriculture curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the curriculum that will allow and encourage collaboration with professionals currently in the agriscience field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the diversified agriculture classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and agriscience professionals. Thus, supervised collaboration and immersion into the agriculture industry around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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American Association for Agricultural Education (AAAE)

[aaaeonline.org](http://aaaeonline.org)

Association for Career and Technical Education (ACTE)

[acteonline.org](http://acteonline.org)

Mississippi ACTE

[mississippiacte.com](http://mississippiacte.com)

Mississippi FFA/ Mississippi Association of Vocational Agriculture Teachers (MAVAT)

[mississippiffa.org](http://mississippiffa.org)

National FFA Organization

[ffa.org](http://ffa.org)

National Association of Agricultural Educators (NAAE)

[naae.org](http://naae.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the diversified agriculture mechanization core program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the diversified agriculture mechanization core program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Leadership and SAE For All

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## Competencies and Suggested Objectives

1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. <sup>DOK3</sup>
  - a. Actively participate in FFA activities.
    - Leadership Development Events (LDE)
    - Career Development Events (CDE)
      - Agricultural Mechanization Technology Systems
    - Tractor operations and maintenance contest
    - Arc welding contest
    - Leadership retreats or conferences
    - Industry-related seminars, workshops, or conferences
    - Other related FFA activities
2. Identify potential college and career opportunities in agricultural mechanics. <sup>DOK1</sup>
  - a. Research postsecondary institutions that offer studies in agricultural mechanics or a related field and prepare a two- to three-minute speech on their programs and potential career choices.
  - b. Complete applications for college admission and scholarships.
  - c. Revise a personal résumé for the purpose of applying for a specific job.
  - d. Complete a job application for employment.
  - e. Participate in a mock or real interview.
3. Review the types of programs under Supervised Agricultural Experience (SAE) for All. <sup>DOK1</sup>
  - a. Explore concepts of a Foundational SAE.
    - Career exploration and planning
    - Employability skills for college and career readiness
    - Personal financial management and planning
    - Workplace safety
    - Agricultural literacy
  - b. Explore concepts of an Immersion SAE.
    - Placement/internship
    - Ownership/entrepreneurship
    - Research
      - Experimental
      - Analytical
      - Invention
    - School-based enterprise
    - Service learning

- |  |
|--|
| <p>4. Review individual plans for student Foundational SAE programs. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Assess goal attainment in SAE from the previous year.</li><li>b. Review and update short- and long-range goals pertaining to the SAE program.</li></ul>  |
| <p>5. Develop an Immersion SAE and maintain agricultural records. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Redefine and adjust requirements of agreements between the student, parents, supervisor, and/or employer.</li><li>b. Utilize an electronic/computer-based system of record keeping.</li><li>c. Update SAE records.<ul style="list-style-type: none"><li>• SAE program goals</li><li>• Student inventory related to the SAE program</li><li>• Expense records</li><li>• Income/gift and scholarship records</li><li>• Skill-attainment records</li><li>• Leadership-activity records and participation in FFA activities</li><li>• Community service hours</li></ul></li><li>d. Complete degree and proficiency award applications as they apply to the SAE.</li></ul> |

## Unit 2: Introduction to Agricultural Mechanization

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### Competencies and Suggested Objectives

1. Investigate the role of mechanical technology in agriculture. <sup>DOK1</sup>
  - a. Discuss how mechanization and technology have changed the production of food and fiber.
  - b. Describe the role of emerging technologies in agricultural mechanization.
    - Computers
    - Satellite Global Positioning System (GPS) signals
    - Geographic Information Systems (GIS)
    - Unmanned aerial vehicles and remote sensing through satellite imagery
    - Variable-rate technology
    - Yield mapping
    - Auto steering
  - c. Define power and discuss how it is generated and measured.
  - d. Describe the sources of power used in agricultural mechanization and associate each course with common applications.
    - Internal combustion engine
    - Electric motor
    - Hydraulic systems
    - Pneumatic systems
2. Perform basic measurements to applications in agricultural mechanization technology. <sup>DOK2</sup>
  - a. Read a standard and metric ruler or tape measure as it applies to linear measurement.
  - b. Use graduated containers to measure and calculate amounts of standard and metric liquid measurements.
  - c. Use a speed/composition square to measure and mark angles.
  - d. Apply measuring skills to build a student-made project (e.g., toolbox, chicken tractor, dog box, etc.).
3. Identify physical science applications in agricultural mechanization technology. <sup>DOK2</sup>
  - a. Name the six simple machines and describe applications in agricultural mechanization for each machine.
    - Screw
    - Lever
    - Pulley
    - Wedge
    - Incline plane
    - Wheel and axle
  - b. Calculate the mechanical advantage of a simple machine, such as a lever, pulley, or wedge.

## Unit 3: Safety Applications in Agricultural Mechanization

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### Competencies and Suggested Objectives

1. Conduct agricultural workplace safety inspections to Occupational Safety and Health Administration (OSHA) standards. <sup>DOK2</sup>
  - a. Discuss the risks associated with working in the agricultural industry.
  - b. List OSHA guidelines related to work settings in agriculture.
2. Demonstrate safety procedures associated with equipment and tools in the agricultural mechanization workplace. <sup>DOK2</sup>
  - a. Apply procedures for working in and maintaining a safe, orderly workplace.
  - b. Describe work site and laboratory organization.
  - c. Demonstrate safe use of personal protective equipment (PPE).
    - Safety glasses, goggles, and face shields
    - Protective clothing
      - Coveralls
      - Aprons
      - Shop coats
      - Footwear
      - Gloves
      - Hardhats
      - Masks and respirators
      - Earmuffs and earplugs
  - d. Demonstrate rules for hand and power tools, including basic operation, safeguards in place, danger points, observer safety, fire safety, and electrical safety.
  - e. Demonstrate safety rules and guidelines related to the operation and maintenance of agricultural equipment, including power machinery and implements.

**Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

**Note:** This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.



## Unit 4: Principles of Welding

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### Competencies and Suggested Objectives

1. Describe basic equipment, operations, and procedures, including safety precautions, of arc welding. <sup>DOK2</sup>
  - a. Identify and describe the function and use of PPE and apparel (e.g., clothing, gloves, helmets, safety glasses/goggles).
  - b. Discuss and demonstrate the safety procedures used to prevent electrical shock, eye and skin damage, and respiratory damage while welding.
  - c. List the three major types of welding used in agricultural equipment repair and fabrication and discuss their characteristics and applications.
    - Shielded metal arc welding (SMAW)
    - Gas metal arc welding (GMAW) or metal inert gas (MIG)
    - Gas tungsten arc welding (GTAW) or tungsten inert gas (TIG)
  - d. Describe the purpose/function of tools and accessories used in welding.
    - Electrode holder
    - Ground clamp
    - Cables
    - Electrodes
    - Wire
    - Chipping hammer
    - Wire brush
  - e. Associate common SMAW electrodes and GMAW wire with their weld characteristics and proper use.
  - f. Examine the relationship of amperage, voltage, and electrode type and diameter to electrode and metal type and thickness.
  - g. Discuss common GMAW shielding gases.
  - h. Identify the two types of welds (i.e., fillet [F] and groove [G]).
  - i. Identify the difference between a stringer bead and a weave bead.
  - j. Identify the five different types of weld joints.
    - Butt
    - Lap
    - T-weld
    - Corner
    - Edge
  - k. Compare welding procedures for welding in different welding positions.
    - 1-Flat
    - 2-Horizontal
    - 3-Vertical
    - 4-Overhead
  - l. Identify weld symbols as they are incorporated into plans and/or drawings (e.g., 1G is a flat-groove weld, 2F is a horizontal-fillet weld).

2. Perform welding techniques using SMAW and metal inert gas MIG.<sup>DOK2</sup>
  - a. Demonstrate the procedure for striking an arc and running a flat bead.
  - b. Construct a flat-butt weld.
  - c. Construct a flat-fillet weld.
  - d. Demonstrate the procedure for striking an arc and running a vertical up- and horizontal up-butt weld.
  - e. Demonstrate the procedure for striking an arc and running a vertical up- and horizontal up-fillet weld.

# Unit 5: Oxyfuel Cutting and Welding and Plasma-Cutting Operations

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## Competencies and Suggested Objectives

1. Describe and demonstrate principles of oxyfuel, brazing, and cutting procedures. <sup>DOK2</sup>
  - a. Describe and apply safety procedures and PPE for oxyfuel cutting.
  - b. Identify and describe the function of the different parts of the oxyfuel cutting unit.
    - Cart
    - Cylinder
    - Regulators/gauges
    - Hoses
    - Torch body
    - Brazing, cutting, heating, and welding tips
  - c. Set up, ignite, and shut down oxyfuel cutting equipment.
  - d. Describe the characteristics and uses of the different oxyfuel flames (i.e., neutral, oxidizing, and carbonizing).
  - e. Demonstrate how to make a cut in a mild steel plate.
2. Describe and demonstrate principles of plasma-cutting procedures. <sup>DOK2</sup>
  - a. Describe and apply safety procedures and PPE for plasma cutting.
  - b. Identify and describe the function of the different parts of the plasma-cutting unit.
    - Machine
    - Compressed air/gas
    - Electrode
    - Torch body
    - Cutting tip
    - Ground cable and clamp
  - c. Set up, ignite, and shut down plasma-cutting equipment.
  - d. Describe the characteristics and uses of the plasma-cutting machine.
  - e. Demonstrate how to make a cut in a mild steel plate.
3. Apply skills in welding to complete a welding project (e.g., metal gate, grooming stand, small grill, etc.). <sup>DOK3</sup>

## Unit 6: Hydraulic and Pneumatic Systems in Agriculture

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### Competencies and Suggested Objectives

1. Explore principles of hydraulics and pneumatics. <sup>DOK2</sup>
  - a. Identify major components and the purpose and function of hydraulic and pneumatic systems.
    - Reservoir
    - Pump
    - Control valves
    - Check valves
    - Filter
    - Lines
    - Cylinders (single and double action)
    - Compressors (single spring and double spring action)
    - Lever
    - Pressure gauges
  - b. Describe and apply Pascal's law and Boyle's law.
  - c. Compare and contrast the operation of a pneumatic system to the operation of a hydraulic system.
  - d. Demonstrate the operation of a pneumatic system to perform work.
  - e. Demonstrate the operation of a hydraulic system to perform work.

# Unit 7: Electrical Systems Applications in Agriculture

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## Competencies and Suggested Objectives

1. Describe and apply the use of electrical components and systems in agricultural equipment. <sup>DOK2</sup>
  - a. Identify common symbols, schematics, and drawings of electrical systems.
    - Fuse
    - Circuit breaker
    - Battery
    - Relay
    - Ammeter
    - Resistor
    - Push-button switch
    - Single-receptacle outlet
    - Single-pole switch
    - Double-pole switch
    - Three-way switch
    - Ground connection
    - Wire identification, type, and size codes
    - Schematic for a branch circuit
  - b. Measure resistance, voltage, and current in circuits using multimeter.
  - c. Calculate resistance, voltage, and current in circuits using Ohm's law.
  - d. Compare the functions of basic electrical devices.
    - Conductors
    - Switches
    - Service entrance panel
    - Breaker
    - Receptacle
    - Light
2. Explore the functions of basic electric and electronic devices (e.g., conductors, switches, etc.). <sup>DOK1</sup>
3. Apply electrical wiring and troubleshooting skills to successfully wire a three-way switch with a light receptacle. <sup>DOK3</sup>

# Unit 8: Principles of Engines

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## Competencies and Suggested Objectives

1. Describe the functions and operations of major systems of a small gasoline engine. <sup>DOK2</sup>
  - a. Discuss and apply safety principles while working on engines.
  - b. Describe the basic principles of combustion and force as applied to an internal combustion engine.
  - c. Compare and contrast the operating principles of four- and two-stroke gasoline engines.
  - d. Compare and contrast the operating principles of gasoline and diesel engines.
  - e. Describe the types of the lubrication systems.
    - Splash
    - Pressurized (e.g., plunger and rotary)
  - f. Select proper lubricants and fuels based on the manufacturer's recommendation.
  - g. Describe the types of air- and liquid-cooled engine cooling systems.
    - Air-cooling fins
    - Liquid cooled
      - Water pump
      - Radiator cap
      - Radiator
      - Thermostat
  - h. Describe the parts and function of a small gasoline engine fuel system.
    - Carburetor
    - Tank
    - Pump/gravity flow
    - Filter
  - i. Describe the parts and functions of a small gasoline engine ignition system.
    - Spark plug
    - Ignition coil
    - Switch
    - Power source (battery pull rope)
2. Investigate the functions and operations of major systems of a diesel engine and compare them to a small gasoline engine. <sup>DOK2</sup>
  - a. Discuss and apply safety principles while working on engines.
  - b. Describe the basic principles of combustion and force as applied to an internal combustion diesel engine.
3. Disassemble, inspect, and reassemble a small gasoline engine. <sup>DOK3</sup>
  - a. Disassemble a small gasoline engine, including removing the head, oil pan, piston and crankshaft assembly, and valves.
  - b. Inspect and measure parts of the engine to verify it is within the tolerances set by the manufacturer.
  - c. Reassemble the engine and test for proper operation (e.g., compression, ignition).

# Unit 9: Management and Operation of Agricultural Equipment

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## Competencies and Suggested Objectives

1. Describe the importance of machinery management and maintenance. <sup>DOK1</sup>
2. Demonstrate the proper safety principles and operational skills for mechanized agricultural equipment. <sup>DOK2</sup>
  - a. Identify common equipment controls and describe their use and function.
    - Throttle
    - Clutch
    - Brakes
    - Hydraulic valves
    - Transmission shift controls
  - b. Demonstrate the procedures for pre-inspection and start-up of an internal combustion engine.
    - Locate and interpret operation procedures in the owner’s manual.
    - Observe or operate any locally available equipment in a safe and proper manner, including driving, backing two-wheeled equipment, and properly hitching to selected equipment
    - Check the oil level.
    - Check the fuel level.
    - Check the fuel shutoff valve.
    - Check for obstructions.
    - Check the coolant fluid level if liquid cooled, the fins if air cooled.
    - Check the tire inflation.
    - Check the brakes.
    - Check the clutch.
    - Adjust the seat and seat belt.
    - Adjust the steering.
    - Check the throttle.
      - Operation inspection
    - Oil pressure
    - Ammeter
    - Temperature
    - Fuel level (operation)
    - Wear a seat belt.
    - Clutch engagement
    - Clean gear shifting
    - Avoid stalling the engine.
    - Avoid excessive engine speed.
    - Avoid excessive speed.
    - Avoid unsafe conduct during operation.

3. Demonstrate recommended maintenance practices for agricultural equipment. <sup>DOK3</sup>
- a. Discuss the meaning of *preventative maintenance*.
  - b. Locate and interpret preventative maintenance information in the owner's manual.
  - c. Perform maintenance routines.
    - Inspect and service the air cleaner.
    - Inspect and service the lubrication system.
    - Inspect and service the fuel system.
    - Inspect and service belts and hoses.
    - Inspect and service a liquid coolant system.
  - d. Complete a work order for a given repair or maintenance procedure and calculate the cost of the repair.



# Student Competency Profile

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**Student's Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Leadership and SAE for All</b>		
	1.	Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration.
	2.	Identify potential college and career opportunities in agricultural mechanics.
	3.	Review the types of programs under SAE for All.
	4.	Review individual plans for student Foundational SAE programs.
	5.	Develop an Immersion SAE and maintain agricultural records.
<b>Unit 2: Introduction to Agricultural Mechanization</b>		
	1.	Investigate the role of mechanical technology in agriculture.
	2.	Perform basic measurements to applications in agricultural mechanization technology.
	3.	Identify physical science applications in agricultural mechanization technology.
<b>Unit 3: Safety Applications in Agricultural Mechanization</b>		
	1.	Conduct agricultural workplace safety inspections to Occupational Safety and Health Administration (OSHA) standards.
	2.	Demonstrate safety procedures associated with equipment and tools in the agricultural mechanization workplace.
<b>Unit 4: Principles of Welding</b>		
	1.	Describe basic equipment, operations, and procedures, including safety precautions, of arc welding.
	2.	Perform welding techniques using SMAW and metal inert gas MIG.
<b>Unit 5: Oxyfuel Cutting and Welding and Plasma-Cutting Operations</b>		
	1.	Describe and demonstrate principles of oxyfuel, brazing, and cutting procedures.
	2.	Describe and demonstrate principles of plasma-cutting procedures.
	3.	Apply skills in welding to complete a welding project (e.g., metal gate, grooming stand, small grill, etc.).
<b>Unit 6: Hydraulic and Pneumatic Systems in Agriculture</b>		
	1.	Explore principles of hydraulics and pneumatics.
<b>Unit 7: Electrical Systems Applications in Agriculture</b>		

	1.	Describe and apply the use of electrical components and systems in agricultural equipment.
	2.	Explore the functions of basic electric and electronic devices (e.g., conductors, switches, etc.).
	3.	Apply electrical wiring and troubleshooting skills to successfully wire a three-way switch with a light receptacle.
<b>Unit 8: Principles of Engines</b>		
	1.	Describe the functions and operations of major systems of a small gasoline engine.
	2.	Investigate the functions and operations of major systems of a diesel engine and compare to a small gasoline engine.
	3.	Disassemble, inspect, and reassemble a small gasoline engine.
<b>Unit 9: Management and Operation of Agricultural Equipment</b>		
	1.	Describe the importance of machinery management and maintenance.
	2.	Demonstrate the proper safety principles and operational skills for mechanized agricultural equipment.
	3.	Demonstrate recommended maintenance practices for agricultural equipment.

## Appendix: Industry Standards

### Framework for AFNR Content Standards and Performance Elements Crosswalk for Diversified Agriculture Mechanization Core

	Unit	1	2	3	4	5	6	7	8	9
AFNR										
ABS- Agribusiness Systems		X								
AS- Animal Systems										
BS- Biotechnology										
CRP- Career Ready Practices		X	X	X	X	X	X	X	X	X
CS- AFNR Cluster Skill		X	X	X	X	X	X	X	X	X
ES- Environmental Service Systems										
FPP- Food Products and Processing Systems										
NRS- Natural Resource Systems										
PS- Plant Systems			X							
PST- Power, Structural, and Technical Systems		X	X	X	X	X	X	X	X	X

### AFNR Pathway Content Standards and Performance Elements

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**ABS AGRIBUSINESS SYSTEMS**  
**AS ANIMAL SYSTEMS**  
**BS BIOTECHNOLOGY**  
**CRP CAREER READY PRACTICES**  
**CS AGRICULTURE FOOD AND NATURAL RESOURCES CLUSTER SKILL**  
**ES ENVIRONMENTAL SERVICE SYSTEMS**  
**FPP FOOD PRODUCTS AND PROCESSING SYSTEMS**  
**NRS NATURAL RESOURCE SYSTEMS**  
**PS PLANT SYSTEMS**  
**PST POWER, STRUCTURAL, AND TECHNICAL SYSTEMS**

## Agribusiness Systems Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), and business planning, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agribusiness Systems (AG-ABS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ABS.01. CCTC Standard:** Apply management planning principles in AFNR businesses.

**ABS.01.01. Performance Indicator:** Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.

**ABS.01.02. Performance Indicator:** Read, interpret, evaluate and write statements of purpose to guide business goals, objectives and resource allocation.

**ABS.01.03. Performance Indicator:** Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.

**ABS.01.04. Performance Indicator:** Evaluate, develop and implement procedures used to recruit, train and retain productive human resources for AFNR businesses.

**ABS.02. CCTC Standard:** Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

**ABS.02.01. Performance Indicator:** Apply fundamental accounting principles, systems, tools and applicable laws and regulations to record, track and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

**ABS.02.02. Performance Indicator:** Assemble, interpret and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash-flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

**ABS.03. CCTC Standard:** Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

**ABS.03.01. Performance Indicator:** Develop, assess and manage cash budgets to achieve AFNR business goals.

**ABS.03.02. Performance Indicator:** Analyze credit needs and manage credit budgets to achieve AFNR business goals.

**ABS.04. CCTC Standard:** Develop a business plan for an AFNR business.

**ABS.04.01. Performance Indicator:** Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

**ABS.04.02. Performance Indicator:** Develop production and operational plans for an AFNR business.

**ABS.04.03. Performance Indicator:** Identify and apply strategies to manage or mitigate risk.

**ABS.05. CCTC Standard:** Use sales and marketing principles to accomplish AFNR business objectives.

**ABS.05.01. Performance Indicator:** Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.

**ABS.05.02. Performance Indicator:** Assess and apply sales principles and skills to accomplish AFNR business objectives.

**ABS.05.03. Performance Indicator:** Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

## Animal Systems Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, and management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Animal Systems (AG-AS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**AS.01. CCTC Standard:** Analyze historic and current trends impacting the animal systems industry.

**AS.01.01. Performance Indicator:** Evaluate the development and implications of animal origin, domestication and distribution on production practices and the environment.

**AS.01.02. Performance Indicator:** Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.

- AS.01.03. Performance Indicator:** Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.
- AS.02. CCTC Standard:** Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.
- AS.02.01. Performance Indicator:** Demonstrate management techniques that ensure animal welfare.
- AS.02.02. Performance Indicator:** Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).
- AS.03. CCTC Standard:** Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.
- AS.03.01. Performance Indicator:** Analyze the nutritional needs of animals.
- AS.03.02. Performance Indicator:** Analyze feed rations and assess if they meet the nutritional needs of animals.
- AS.03.03. Performance Indicator:** Utilize industry tools to make animal nutrition decisions.
- AS.04. CCTC Standard:** Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.
- AS.04.01. Performance Indicator:** Evaluate animals for breeding readiness and soundness.
- AS.04.02. Performance Indicator:** Apply scientific principles to select and care for breeding animals.
- AS.04.03. Performance Indicator:** Apply scientific principles to breed animals.
- AS.05. CCTC Standard:** Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.
- AS.05.01. Performance Indicator:** Design animal housing, equipment and handling facilities for the major systems of animal production.
- AS.05.02. Performance Indicator:** Comply with government regulations and safety standards for facilities used in animal production.
- AS.06. CCTC Standard:** Classify, evaluate and select animals based on anatomical and physiological characteristics.
- AS.06.01. Performance Indicator:** Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).
- AS.06.02. Performance Indicator:** Apply principles of comparative anatomy and physiology to uses within various animal systems.
- AS.06.03. Performance Indicator:** Select and train animals for specific purposes and maximum performance based on anatomy and physiology.
- AS.07. CCTC Standard:** Apply principles of effective animal health care.
- AS.07.01. Performance Indicator:** Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

**AS.07.02. Performance Indicator:** Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

**AS.08. CCTC Standard:** Analyze environmental factors associated with animal production.

**AS.08.01. Performance Indicator:** Design and implement methods to reduce the effects of animal production on the environment.

**AS.08.02. Performance Indicator:** Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

## Common Career Technical Core Career Ready Practices Content Standards

The CCTC CRPs encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical-thinking, problem solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

**DEFINITIONS:** Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for CRPs from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a CTE program of study.

**CRP.01. CCTC Standard:** Act as a responsible and contributing citizen and employee.

**CRP.01.01. Performance Indicator:** Model personal responsibility in the workplace and community.

**CRP.01.02 Performance Indicator:** Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.

**CRP.01.03. Performance Indicator:** Identify and act upon opportunities for professional and civic service at work and in the community.

**CRP.02. CCTC Standard:** Apply appropriate academic and technical skills.

**CRP.02.01. Performance Indicator:** Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

**CRP.02.02. Performance Indicator:** Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

**CRP.03. CCTC Standard:** Attend to personal health and financial well-being.

**CRP.03.01. Performance Indicator:** Design and implement a personal wellness plan.

**CRP.03.02. Performance Indicator:** Design and implement a personal financial management plan.

**CRP.04. CCTC Standard:** Communicate clearly, effectively and with reason.

**CRP.04.01. Performance Indicator:** Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

**CRP.04.02. Performance Indicator:** Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

**CRP.04.03. Performance Indicator:** Model active listening strategies when interacting with others in formal and informal settings.

**CRP.05. CCTC Standard:** Consider the environmental, social and economic impacts of decisions.

**CRP.05.01. Performance Indicator:** Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.

**CRP.05.02. Performance Indicator:** Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

**CRP.06. CCTC Standard:** Demonstrate creativity and innovation.

**CRP.06.01. Performance Indicator:** Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

**CRP.06.02. Performance Indicator:** Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

**CRP.06.03. Performance Indicator:** Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

**CRP.07. CCTC Standard:** Employ valid and reliable research strategies.

**CRP.07.01. Performance Indicator:** Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

**CRP.07.02. Performance Indicator:** Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

**CRP.08. CCTC Standard:** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP.08.01. Performance Indicator:** Apply reason and logic to evaluate workplace and community situations from multiple perspectives.



**CRP.08.02. Performance Indicator:** Investigate, prioritize and select solutions to solve problems in the workplace and community.

**CRP.08.03. Performance Indicator:** Establish plans to solve workplace and community problems and execute them with resiliency.

**CRP.09. CCTC Standard:** Model integrity, ethical leadership and effective management.

**CRP.09.01. Performance Indicator:** Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

**CRP.09.02. Performance Indicator:** Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

**CRP.09.03. Performance Indicator:** Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

**CRP.10. CCTC Standard:** Plan education and career path aligned to personal goals.

**CRP.10.01. Performance Indicator:** Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

**CRP.10.02. Performance Indicator:** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

**CRP.10.03. Performance Indicator:** Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

**CRP.10.04. Performance Indicator:** Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

**CRP.11. CCTC Standard:** Use technology to enhance productivity.

**CRP.11.01. Performance Indicator:** Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

**CRP.11.02. Performance Indicator:** Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.

**CRP.12. CCTC Standard:** Work productively in teams while using cultural/global competence.

**CRP.12.01. Performance Indicator:** Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

**CRP.12.02. Performance Indicator:** Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

## **Agriculture, Food, and Natural Resources Cluster Skill Content Standards**

The AFNR Cluster Skills (CS) encompasses the study of fundamental knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career

pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agriculture, Food and Natural Resources Career Cluster® (AG) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**CS.01. CCTC Standard:** Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

**CS.01.01. Performance Indicator:** Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

**CS.01.02. Performance Indicator:** Examine technologies and analyze their impact on AFNR systems.

**CS.01.03. Performance Indicator:** Identify public policies and examine their impact on AFNR systems.

**CS.02. CCTC Standard:** Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

**CS.02.01. Performance Indicator:** Research and use geographic and economic data to solve problems in AFNR systems.

**CS.02.02. Performance Indicator:** Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

**CS.03. CCTC Standard:** Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

**CS.03.01. Performance Indicator:** Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.

**CS.03.02. Performance Indicator:** Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

**CS.03.03. Performance Indicator:** Apply health and safety practices to AFNR workplaces.

**CS.03.04. Performance Indicator:** Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

- CS.04. CCTC Standard:** Demonstrate stewardship of natural resources in AFNR activities.
- CS.04.01. Performance Indicator:** Identify and implement practices to steward natural resources in different AFNR systems.
- CS.04.02. Performance Indicator:** Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.
- CS.05. CCTC Standard:** Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
- CS.05.01. Performance Indicator:** Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).
- CS.06. CCTC Standard:** Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.
- CS.06.01. Performance Indicator:** Examine and explain foundational cycles and systems of AFNR.
- CS.06.02. Performance Indicator:** Analyze and explain the connection and relationships between different AFNR systems on a national and global level.

## Biotechnology Systems Career Pathway Content Standards

The Biotechnology Systems (BS) Career Pathway encompasses the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- **National Council for Agricultural Education (NCAE) Standard\*** – These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying biotechnology to AFNR systems.
- **Performance Indicators** – These statements distill each performance element into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related performance element at the conclusion of a program of study in this area.

- BS.01. NCAE Standard:** Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).
- BS.01.01. Performance Indicator:** Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).

**BS.01.02. Performance Indicator:** Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).

**BS.01.03. Performance Indicator:** Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

**BS.02. NCAE Standard:** Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

**BS.02.01. Performance Indicator:** Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.

**BS.02.02. Performance Indicator:** Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.

**BS.02.03. Performance Indicator:** Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

**BS.02.04. Performance Indicator:** Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

**BS.02.05. Performance Indicator:** Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

**BS.03. NCAE Standard:** Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

**BS.03.01. Performance Indicator:** Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

**BS.03.02. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

**BS.03.03. Performance Indicator:** Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

**BS.03.04. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

**BS.03.05. Performance Indicator:** Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).

**BS.03.06. Performance Indicator:** Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

## Environmental Service Systems Career Pathway Content Standards

The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Environmental Service Systems (AG-ESS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ESS.01. CCTC Standard:** Use analytical procedures and instruments to manage environmental service systems.

**ESS.01.01. Performance Indicator:** Analyze and interpret laboratory and field samples in environmental service systems.

**ESS.01.02. Performance Indicator:** Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

**ESS.02. CCTC Standard:** Evaluate the impact of public policies and regulations on environmental service system operations.

**ESS.02.01. Performance Indicator:** Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.

**ESS.02.02. Performance Indicator:** Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).

**ESS.02.03. Performance Indicator:** Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

**ESS.03. CCTC Standard:** Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

**ESS.03.01. Performance Indicator:** Apply meteorology principles to environmental service systems.

**ESS.03.02. Performance Indicator:** Apply soil science and hydrology principles to environmental service systems.

**ESS.03.03. Performance Indicator:** Apply chemistry principles to environmental service systems.

**ESS.03.04. Performance Indicator:** Apply microbiology principles to environmental service systems.

**ESS.03.05. Performance Indicator:** Apply ecology principles to environmental service systems.

**ESS.04. CCTC Standard:** Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

**ESS.04.01. Performance Indicator:** Use pollution control measures to maintain a safe facility and environment.

**ESS.04.02. Performance Indicator:** Manage safe disposal of all categories of solid waste in environmental service systems.

**ESS.04.03. Performance Indicator:** Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

**ESS.04.04. Performance Indicator:** Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.

**ESS.05. CCTC Standard:** Use tools, equipment, machinery and technology common to tasks in environmental service systems.

**ESS.05.01. Performance Indicator:** Use technological and mathematical tools to map land, facilities and infrastructure for environmental service systems.

**ESS.05.02. Performance Indicator:** Perform assessments of environmental conditions using equipment, machinery and technology.

## **Food Products and Processing Systems Career Pathway Content Standards**

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety and sanitation; nutrition, biology, microbiology, chemistry and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Food Products and Processing Systems (AG-FPP) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to

demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**FPP.01. CCTC Standard:** Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

**FPP.01.01. Performance Indicator:** Analyze and manage operational and safety procedures in food products and processing facilities.

**FPP.01.02. Performance Indicator:** Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

**FPP.01.03. Performance Indicator:** Apply food safety procedures when storing food products to ensure food quality.

**FPP.02. CCTC Standard:** Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

**FPP.02.01. Performance Indicator:** Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.02. Performance Indicator:** Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.03. Performance Indicator:** Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.03. CCTC Standard:** Select and process food products for storage, distribution and consumption.

**FPP.03.01. Performance Indicator:** Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

**FPP.03.02. Performance Indicator:** Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

**FPP.03.03. Performance Indicator:** Create food distribution plans and procedures to ensure safe delivery of food products.

**FPP.04. CCTC Standard:** Explain the scope of the food industry and the historical and current developments of food product and processing.

**FPP.04.01. Performance Indicator:** Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

**FPP.04.02. Performance Indicator:** Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

**FPP.04.03. Performance Indicator:** Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

## Natural Resource Systems Career Pathway Content Standards

The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of natural resource systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Natural Resource Systems (AG-NRS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**NRS.01. CCTC Standard:** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

**NRS.01.01. Performance Indicator:** Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.

**NRS.01.02. Performance Indicator:** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.

**NRS.01.03. Performance Indicator:** Apply ecological concepts and principles to atmospheric natural resource systems.

**NRS.01.04. Performance Indicator:** Apply ecological concepts and principles to aquatic natural resource systems.

**NRS.01.05. Performance Indicator:** Apply ecological concepts and principles to terrestrial natural resource systems.

**NRS.01.06. Performance Indicator:** Apply ecological concepts and principles to living organisms in natural resource systems.

**NRS.02. CCTC Standard:** Analyze the interrelationships between natural resources and humans.

**NRS.02.01. Performance Indicator:** Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).

**NRS.02.02. Performance Indicator:** Assess the impact of human activities on the availability of natural resources.

**NRS.02.03. Performance Indicator:** Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.



**NRS.02.04. Performance Indicator:** Examine and explain how economics affects the use of natural resources.

**NRS.02.05. Performance Indicator:** Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

**NRS.03. CCTC Standard:** Develop plans to ensure sustainable production and processing of natural resources.

**NRS.03.01. Performance Indicator:** Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

**NRS.03.02. Performance Indicator:** Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

**NRS.04. CCTC Standard:** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

**NRS.04.01. Performance Indicator:** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

**NRS.04.02. Performance Indicator:** Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

**NRS.04.03. Performance Indicator:** Prevent or manage introduction of ecologically harmful species in a particular region.

**NRS.04.04. Performance Indicator:** Manage fires in natural resource systems.

## Plant Science Systems Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Plant Systems (AG-PS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

- PS.01. CCTC Standard:** Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- PS.01.01. Performance Indicator:** Determine the influence of environmental factors on plant growth.
- PS.01.02. Performance Indicator:** Prepare and manage growing media for use in plant systems.
- PS.01.03. Performance Indicator:** Develop and implement a fertilization plan for specific plants or crops.
- PS.02. CCTC Standard:** Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.01. Performance Indicator:** Classify plants according to taxonomic systems.
- PS.02.02. Performance Indicator:** Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Performance Indicator:** Apply knowledge of plant physiology and energy conversion to plant systems.
- PS.03. CCTC Standard:** Propagate, culture and harvest plants and plant products based on current industry standards.
- PS.03.01. Performance Indicator:** Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Performance Indicator:** Develop and implement a management plan for plant production.
- PS.03.03. Performance Indicator:** Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Performance Indicator:** Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Performance Indicator:** Harvest, handle and store crops according to current industry standards.
- PS.04. CCTC Standard:** Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- PS.04.01. Performance Indicator:** Evaluating, identifying and preparing plants to enhance an environment.
- PS.04.02. Performance Indicator:** Create designs using plants.

## Power, Structural and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Power, Structural and Technical Systems (AG-PST) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**PST.01. CCTC Standard:** Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

**PST.01.01. Performance Indicator:** Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.

**PST.01.02. Performance Indicator:** Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.

**PST.01.03. Performance Indicator:** Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).

**PST.02. CCTC Standard:** Operate and maintain AFNR mechanical equipment and power systems.

**PST.02.01. Performance Indicator:** Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.

**PST.02.02. Performance Indicator:** Operate machinery and equipment while observing all safety precautions in AFNR settings.

**PST.03. CCTC Standard:** Service and repair AFNR mechanical equipment and power systems.

**PST.03.01. Performance Indicator:** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.

**PST.03.02. Performance Indicator:** Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.

**PST.03.03. Performance Indicator:** Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

**PST.04. CCTC Standard:** Plan, build and maintain AFNR structures.

**PST.04.01. Performance Indicator:** Create sketches and plans for AFNR structures.

**PST.04.02. Performance Indicator:** Determine structural requirements, specifications and estimate costs for AFNR structures

**PST.04.03. Performance Indicator:** Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).

**PST.04.04. Performance Indicator:** Apply electrical wiring principles in AFNR structures.

**PST.05. CCTC Standard:** Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.

**PST.05.01. Performance Indicator:** Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

**PST.05.02. Performance Indicator:** Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.

**PST.05.03. Performance Indicator:** Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.





## 2022 Diversified Agriculture Plants Core

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE diversified agriculture plants core curriculum is aligned to the following standards:

## **National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards**

The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in Grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted by the National Council for Agricultural Education and are used with permission.

[thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr)

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oe/college-and-career-readiness-standards](http://mdek12.org/oe/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

The diversified agriculture plants core curriculum is a one-Carnegie unit course within the four-credit diversified agriculture pathway. All students must successfully complete the principles of agriscience prerequisite course before being allowed to enroll in the diversified agriculture plants core course. This course is centered on agricultural plant growth, production, and management and harvesting. The course provides an opportunity for students to go in-depth regarding plant production in various areas of agriculture, from food and fiber crops, to forestry, landscape, and ornamental horticulture and alternative fuel crops.

## College, Career, and Certifications

No national industry-recognized secondary certifications are known to exist at this time in the field of agriculture plants. Competencies and suggested performance indicators in the horticulture courses have been correlated, however, to the AFNR Career Cluster Content Standards that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
  2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
  3. Instructor approval and TABE reading score (eighth grade or higher)
- or**
1. TABE reading and math score (eighth grade or higher)
  2. Instructor approval
- or**
1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Applied Academic Credit

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

### **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

### **Professional Learning**

If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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This curriculum consists of one 1-credit course.

## **Diversified Agriculture Plants Core—Course Code: 991003**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Leadership and SAE for All	10
2	Seed Quality	15
3	Plant Growth, Nutrition, and Fertilization	20
4	Greenhouse Management	15
5	Pest Management	15
6	Marketing in Plant Production	15
7	Agronomic Crop Production	10
8	Turf and Forage Crop Production	10
9	Olericulture and Pomology	10
10	Ornamental Horticulture	10
11	Silviculture	10
<b>Total</b>		<b>140</b>

# Career Pathway Outlook

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## Overview

The agricultural sciences career cluster covers the broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. According to the U.S. Department of Agriculture, during the next five years (2020-2025) 59,400 jobs are expected to open in food, agriculture, renewable natural resources, or the environment for graduates with bachelor's or higher degrees in those areas. Almost half of those jobs will be in management and business at 42%; 31% in science, technology, engineering, and math in agriculture; 13% in sustainable food and biomaterials production; and 14% in education, communication, and government services. According to USDA, agriculture, food, and related industries contributed \$1.109 trillion to the U.S. gross domestic product (GDP) in 2019. The Mississippi Department of Agriculture and Commerce reports that agriculture is Mississippi's number one industry at \$7.35 billion and employing approximately 17.4% of the state's workforce.

Diversified agriculture will target careers at the professional and technical levels in agriculture. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college levels.

## Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (2016). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Yearly Earnings, 2020
Agricultural and Food Science Technicians	260	270	10	3.9%	\$39,270
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	\$93,260
Animal Trainers	100	110	10	10%	\$23,120
Career/Technical Education Teachers, Middle School	320	350	30	9.4%	\$47,270
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	\$50,370
Conservation Scientists	700	730	30	4.3%	\$54,950
Environmental Engineers	410	420	10	2.4%	\$75,940
Environmental Engineering Technicians	160	170	10	6.3%	\$46,790
Environmental Scientists and Specialists, Including Health	620	670	50	8.1%	\$64,460



Environmental Science and Protection Technicians, Including Health	420	460	40	9.5%	\$38,780
Farm and Home Management Advisors	290	300	10	3.2%	\$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	\$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	\$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	\$24,030
Soil and Plant Scientists	110	110	0	0%	\$92,250
Farmers, Ranchers, and Other Agricultural Managers	1,790	1,840	20	2.8%	\$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2%	\$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	\$54,550
Fish and Game Wardens	40	40	0	0%	\$46,610
Foresters	190	200	10	5.3%	\$52,660
Surveyors	450	470	20	4.4%	\$48,600
Surveying and Mapping Technicians	530	550	20	3.8%	\$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	\$44,920
Veterinarians	490	540	50	10.2%	\$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1,090	120	12.4%	\$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	\$35,890
Zoologists and Wildlife Biologists	260	270	10	3.9%	\$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

### **Perkins V Requirements and Academic Infusion**

The diversified agriculture plants core curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for careers in agriculture. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

### **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## Best Practices

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The diversified agriculture educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the diversified agriculture curriculum. FFA provides students with growth opportunities and competitive events and opens the doors to the world of agriculture and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The diversified agriculture curricula provide opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the curriculum that will allow and encourage collaboration with professionals currently in the agriscience field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the diversified agriculture classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and agriscience professionals. Thus, supervised collaboration and immersion into the agriculture industry around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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American Association for Agricultural Education (AAAE)

[aaaeonline.org](http://aaaeonline.org)

Association for Career and Technical Education (ACTE)

[acteonline.org](http://acteonline.org)

Mississippi ACTE

[mississippiacte.com](http://mississippiacte.com)

Mississippi FFA/ Mississippi Association of Vocational Agriculture Teachers (MAVAT)

[mississippiffa.org](http://mississippiffa.org)

National FFA Organization

[ffa.org](http://ffa.org)

National Association of Agricultural Educators (NAAE)

[naae.org](http://naae.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the diversified agriculture plants core program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the diversified agriculture plants core program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Leadership and SAE for All

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## Competencies and Suggested Objectives

1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. <sup>DOK 3</sup>
  - a. Actively participate in FFA activities.
    - Leadership Development Events (LDE)
    - Career Development Events (CDE)
      - Nursery/Landscape
      - Agronomy
      - Floriculture
    - Leadership retreats or conferences
    - Industry-related seminars, workshops, or conferences
    - Other related FFA activities
2. Identify potential college and career opportunities in plant science. <sup>DOK 2</sup>
  - a. Research postsecondary institutions that offer studies in plant science or a related field and prepare a two- to three-minute speech on their programs and potential career choices.
  - b. Complete applications for college admission and scholarships.
  - c. Revise a personal résumé for the purpose of applying for a specific job.
  - d. Complete a job application for employment.
  - e. Participate in a mock or real interview.
3. Review the types of programs under Supervised Agricultural Experience (SAE) for All. <sup>DOK 1</sup>
  - a. Explore concepts of a Foundational SAE.
    - Career exploration and planning
    - Employability skills for college and career readiness
    - Personal financial management and planning
    - Workplace safety
    - Agricultural literacy
  - b. Explore concepts of an Immersion SAE.
    - Placement/internship
    - Ownership/entrepreneurship
    - Research
      - Experimental
      - Analytical
      - Invention
    - School-based enterprise
    - Service learning

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| <p>4. Review individual plans for student Foundational SAE programs. <sup>DOK 2</sup></p> <ul style="list-style-type: none"><li>a. Assess goal attainment in SAE from the previous year.</li><li>b. Review and update short- and long-range goals pertaining to the SAE program.</li></ul>  |
| <p>5. Develop an Immersion SAE and maintain agricultural records. <sup>DOK 2</sup></p> <ul style="list-style-type: none"><li>a. Redefine and adjust requirements of agreements between the student, parents, supervisor, and/or employer.</li><li>b. Utilize an electronic/computer-based system of record keeping.</li><li>c. Update SAE records.<ul style="list-style-type: none"><li>• SAE program goals</li><li>• Student inventory related to the SAE program</li><li>• Expense records</li><li>• Income/gift and scholarship records</li><li>• Skill-attainment records</li><li>• Leadership-activity records and participation in FFA activities</li><li>• Community service hours</li></ul></li><li>d. Complete degree and proficiency award applications as they apply to the SAE.</li></ul> |

## Unit 2: Seed Quality

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### Competencies and Suggested Objectives

1. Demonstrate general safety procedures for plant production enterprises. <sup>DOK 2</sup>
  - a. Describe the procedures for working in and maintaining a safe, orderly workplace.
  - b. Identify the actions associated with safe personal behavior and conduct.
  - c. Describe work site and laboratory organization procedures.
  - d. Demonstrate the procedures for the safe use of chemicals and other hazardous materials in the laboratory and greenhouse, including the use of safety data sheets (SDS) and personal protective equipment (PPE).
  - e. Read, interpret, and apply the directions on a pesticide label.
    - Active ingredients
    - Safety precautions
    - Hazardous statements
    - Trade name
    - Storage and disposal
2. Conduct a seed-quality evaluation on agronomic and horticultural crops. <sup>DOK 3</sup>
  - a. Differentiate between agronomic and horticultural crops.
  - b. Interpret the information and data found on an agronomic seed tag.
    - Seed company
    - Kind and variety
    - Date tested
    - Purity and germination percentage
    - Percentage weed seed
    - Percentage of inert matter
    - Net weight (in pounds) of seed in the bag
    - State where the seed was grown
  - c. Interpret the information and data found on a horticultural seed tag.
    - Seed company
    - Kind and variety
    - Date tested
    - Purity and germination percentage
  - d. Assess seed samples and complete a seed tag.
    - Calculate the purity and germination percentage.
    - Calculate percentage weed seed.
    - Calculate the percentage by weight of inert matter.
    - Calculate the percentage by weight of other agricultural seeds.
  - e. Select a plant variety for production based on tillage (if applicable); production system; and marketability, cost, and germination rate.

**Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab



simulations and projects. This test should be documented in each student's file.

**Note:** This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

## Unit 3: Plant Growth, Nutrition, and Fertilization

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### Competencies and Suggested Objectives

1. Demonstrate the role of air, water, light, and growing media in relation to plant growth.<sup>DOK2</sup>
  - a. Explain how environmental factors affect photosynthesis in plants.
  - b. Explain how environmental factors influence plant respiration during growth.
  - c. Explain how environmental factors affect plant transpiration during growth.
2. Explain how fertilizers and soil amendments can be added to growing media to improve plant productivity.<sup>DOK 2</sup>
  - a. Describe the characteristics of an ideal growing medium.
    - Nutrients (e.g., primary and secondary macronutrients and micronutrients)
    - Water and air holding capacity
    - Water drainage
    - pH
  - b. List the types of soil amendments used to improve soil or growing media.
    - Organic soil amendments (e.g., leaf matter, peat moss, bark)
    - Inorganic soil amendments (e.g., perlite, vermiculite)
  - c. Classify the types of materials used to make fertilizers.
    - Inorganic
    - Natural organic
    - Synthetic organic fertilizers
  - d. Analyze a fertilizer label.
  - e. Identify the forms of fertilizers.
    - Granular
    - Water soluble
    - Slow release
    - Organic
  - f. Describe the different fertilizer application methods.
    - Top dressing
    - Broadcast
    - Band application
    - Side dressing
    - Foliar feeding
    - Fertigation

# Unit 4: Greenhouse Management

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## Competencies and Suggested Objectives

1. Research the use of various plant-growing structures and their environmental control systems. <sup>DOK 1</sup>
  - a. Compare and contrast the types of growing structures and greenhouses.
    - Lathe house
    - High tunnels
    - Greenhouses (e.g., Quonset, ridge and furrow, lean-to, gothic, even span)
  - b. Identify and discuss the coverings used on greenhouses.
    - Fiberglass
    - Polyethylene
    - Acrylic sheets
    - Polycarbonate
    - Shade cloth
  - c. Differentiate between environmental control systems.
    - Cooling
    - Watering
    - Ventilation
    - Temperature control
2. Create a management plan for a hydroponics growing system. <sup>DOK 3</sup>
  - a. Research and formulate management practices for hydroponic plant production.
  - b. Construct a hydroponics plant system that will support plant production.
  - c. Design a small-scale farm that includes hydroponics, urban farming, or rooftop gardens.
3. Discuss the benefits and uses of irrigation in plant production. <sup>DOK 2</sup>
  - a. Describe the history and development of irrigation methods in agriculture.
  - b. Explain the use of irrigation for various types of crops.
  - c. Differentiate between water management methods in plant production.
    - Hand watering
    - Overhead irrigation
    - Drip irrigation
    - Sprinkle irrigation
  - d. Describe irrigation scheduling.
  - e. Relate the importance of water quality to irrigation.
  - f. List and describe the sources of irrigation water.
    - Public water system
    - Private well
    - Pond/lake
    - Flowing water

# Unit 5: Pest Management

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## Competencies and Suggested Objectives

1. Assess the effects of pests on plant production. <sup>DOK 2</sup>
  - a. Describe a healthy plant.
  - b. Explain how plant pests cause loss in plant production.
  - c. Describe the categories of plant pests according to the National FFA Agronomy and Nursery/Landscape CDE list (e.g., insects, diseases, weeds, etc.) and describe how each affects production.
    - Insects
      - Siphoning mouthparts
      - Chewing mouthparts
      - Sucking mouthparts
      - Piercing mouthparts
    - Diseases
      - Fungi
      - Viruses
      - Bacteria
    - Weeds
      - Annuals
      - Perennials
      - Biennials
2. Examine concepts of plant pest management. <sup>DOK 2</sup>
  - a. Describe the characteristics of an agroecosystem as it relates to pest management in plant production.
  - b. Identify beneficial and harmful insects based on the National FFA Agronomy CDE list and discuss how each affect plants.
  - c. Describe the role of genetically modified crops in pest management.
  - d. Discuss environmental protection practices regarding pesticide use.
3. Describe the concept of integrated pest management (IPM) in plant production. <sup>DOK 2</sup>
  - a. Define IPM.
  - b. Determine the benefits of IPM to plant production.
  - c. List and describe the various pest management methods used within IPM.
    - Biological
    - Chemical
    - Cultural
    - Mechanical

## Unit 6: Marketing in Plant Production

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### Competencies and Suggested Objectives

1. Investigate marketing practices used in crop and plant production. <sup>DOK 2</sup>
  - a. Define terms associated with marketing plant products.
    - Supply
    - Demand
    - Profit
    - Consumer
    - Marketing
    - Selling
    - Advertising
  - b. Identify economic factors to consider in marketing crops and plants to be produced.
    - Utility
    - Law of demand
    - Law of supply
    - Equilibrium price
    - Price discovery
    - Economics of size
  - c. Explore market availability.
    - Wholesale markets
    - Retail markets
    - Cooperatives
    - Regional and terminal markets
    - Farmers markets
    - Commodity and futures markets
  - d. Investigate trends and cycles in marketing plant products.
    - Specialty markets
    - Product labeling
    - Seasonal markets
2. Develop a crop management plan for a selected crop, including a marketing plan. <sup>DOK 4</sup>
  - a. Formulate a budget for the crop production.
  - b. Create a crop calendar, including the critical steps in producing the crop, from planting to harvest.
  - c. Design a marketing concept for the crop, including advertising and selling to targeted markets.
  - d. Predict risks associated with producing the selected crop.

# Unit 7: Agronomic Crop Production

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## Competencies and Suggested Objectives

1. Identify the seeds and/or plants grown in agronomy by their crop and botanical names.<sup>DOK1</sup>
  - a. Grain crops
    - Corn
    - Wheat
    - Rice
    - Soybeans
    - Milo/grain sorghum
  - b. Sugar crops
    - Sugarcane
    - Sugar beets
  - c. Oil crops
    - Cotton
    - Soybeans
    - Corn
    - Sunflowers
    - Peanuts
  - d. Fiber crops
    - Cotton
2. Explain the cultural practices required of selected agronomic crops.<sup>DOK 2</sup>
  - a. Determine when the crop can be planted.
  - b. Describe the equipment required for crop production.
    - Machinery
      - Bale wagon
      - Baler
      - Bean harvester head
      - Bed mulcher
      - Combine
      - Conveyor/elevator
      - Corn harvester head
      - Cotton picker/stripper
      - Crop cultivator
      - Row crop planter
      - Disc mower
      - Drill planter
      - Fertilizer broadcaster
      - Forage harvester
      - Grain auger
      - Grain storage bin/dryer

- Gravity wagon
- Hay rake
- In-line ripper
- Liquid manure/fertilizer spreader
- Manure spreader (dry)
- Module builder
- Moldboard plow
- Pea harvester
- Peanut digger
- Plow (soil chisel)
- Potato harvester
- Tractor
- Vegetable transplanter
- Equipment
  - Air compressor/hose
  - Anemometer
  - Backpack sprayer
  - Bed shaper
  - Chemigation unit
  - Field shovel
  - Fire extinguisher
  - Gauge wheel
  - Global Positioning System (GPS) receiver and light bar
  - Grain moisture meter
  - Hearing protection
  - Hitch pin
  - Hoe
  - Hydraulic hose
  - Nozzle bodies (flood vs. flat fan)
  - PPE (e.g., ear plugs, respirator, chemical mask, earmuffs, dust mask, face shield, safety glasses, safety goggles, apron, rubber gloves, rubber boots, Tyvek coveralls)
  - Press wheel
  - Pressure gauge
  - Pressure regulator
- c. Explain the environmental factors related to the production of the crop, including soil type and land capability class, if applicable.
- d. Describe how the crop is to be harvested.
- e. Explain how the crop is marketed.

- |   |
|---|
| <p>3. Research applications of precision technology for plant production enterprises. <sup>DOK 2</sup></p> <p>a. Demonstrate the use of tools in modern precision agriculture farming.</p> <ul style="list-style-type: none"><li>• Computers</li><li>• Satellite GPS signals</li><li>• Geographic Information Systems (GIS)</li><li>• Unmanned aerial and satellite imagery</li><li>• Variable-rate technology</li></ul> <p>b. Use handheld devices to capture and record GPS field locations.</p> <ul style="list-style-type: none"><li>• Load the captured points into Google Earth, ArcGIS Online, or QGIS.</li><li>• Create a field-boundary polygon shapefile with GPS field points.</li></ul> |
| <p>4. Analyze data captured by remote sensing technology and apply it to cultural precision-agriculture practices with a specific crop. <sup>DOK 3</sup></p> <p>a. Summarize methods to reduce crop production variability in season.</p> <ul style="list-style-type: none"><li>• Variable-rate planting and fertilizing across variable soils</li><li>• Water management practices</li></ul>   |
| <p>5. Assess specific crop conditions and formulate an irrigation plan for that crop. <sup>DOK3</sup></p> <p>a. Differentiate between water management methods in crop production.</p> <ul style="list-style-type: none"><li>• Flood irrigation</li><li>• Furrow irrigation</li><li>• Center pivot irrigation</li></ul> <p>b. Design a water management plan for a specific crop.</p> <p>c. Evaluate the effectiveness of the plan for the specified crop by designing an experiment to determine whether plants are getting enough water.</p>  |



# Unit 8: Turf and Forage Crop Production

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## Competencies and Suggested Objectives

1. Identify the seeds and/or plants grown in the forage and turfgrass industries by their crop and botanical names. <sup>DOK 1</sup>
  - a. Discuss how turfgrasses grow.
  - b. Illustrate on a map the major areas of turf production in the United States.
  - c. Identify forage grasses by their common name and use.
    - Bahia grass
    - Bermuda grass
    - Brome grass
    - Dallis grass
    - Fescue
    - Kentucky bluegrass
    - Ryegrass
    - Timothy grass
  - d. Identify forage legumes by their common name and use.
    - Alfalfa
    - Clover
    - Lespedeza
    - Vetch
  - e. Identify common turfgrasses by their common name and use.
    - Bermuda grass
    - Centipede grass
    - Saint Augustine
    - Zoysia
    - Kentucky bluegrass
    - Bent grass
    - Fescue
    - Perennial ryegrass
2. Explain the cultural practices required of selected forage and turf crops. <sup>DOK 2</sup>
  - a. Describe the types or varieties that can be grown.
  - b. Explain when the crop can be planted.
  - c. Describe the equipment required for crop production.
  - d. Explain the environmental factors related to the production of the crop, including soil type and land capability class, if applicable.
  - e. Discuss pest management practices associated with the crop.
  - f. Describe how the crop is to be harvested.
  - g. Explain how the crop is marketed and what type of consumer would want to purchase this crop.

# Unit 9: Olericulture and Pomology

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<b>Competencies and Suggested Objectives</b>
1. Compare the differences between olericulture (vegetable), pomology (fruit), and nut crops. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Define vegetables and classify them by their use and climate requirements.</li><li>Define fruits and classify them by their use and climate requirements.</li><li>Define nut crops and classify them by their use and climate requirements.</li></ol>
2. Compare the cultural requirements for vegetable production. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Describe how vegetables are grown, including propagation methods.</li><li>Explain factors that influence vegetable production, including pest management, fertilization, and advances in technology.</li><li>Examine commercial vegetable production enterprises.</li><li>Discuss organic vegetable production.</li></ol>
3. Differentiate between the cultural requirements for fruit production. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Describe how fruits are grown, including propagation methods.</li><li>Explain factors that influence fruit production, including pest management, harvesting, and storage.</li><li>Examine the requirements of commercial fruit production enterprises.</li><li>Discuss organic fruit production.</li></ol>
4. Compare the cultural requirements for nut crop production. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Describe how nut crops are grown, including propagation methods.</li><li>Explain factors that influence nut crop production, including pest management, harvesting, and storage.</li></ol>
5. Grow and/or manage a vegetable, fruit, or nut crop using the school greenhouse, garden, or local land area. <sup>DOK 4</sup> <ol style="list-style-type: none"><li>Create a growing and harvesting timeline for the crop.</li><li>Plant or prepare the crop for the growing season.</li><li>Discuss pest management practices associated with these crops.</li><li>Develop a harvesting and marketing plan for the crop.</li></ol>

# Unit 10: Ornamental Horticulture

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<b>Competencies and Suggested Objectives</b>
1. Describe ornamental horticulture. <sup>DOK 1</sup>
2. Define floriculture and describe floral production. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Describe the culture of greenhouse crops.</li><li>Classify and describe the different floral crops.<ul style="list-style-type: none"><li>Cut flowers</li><li>Container flowering plants</li><li>Foliage plants</li><li>Bedding plants</li></ul></li></ol>
3. Analyze how floral crops are distributed and processed. <sup>DOK 3</sup> <ol style="list-style-type: none"><li>Investigate local floral crop markets.</li><li>Explore the international floral market.</li><li>Examine the floral processing industry.</li><li>Demonstrate how flowers can be marketed through the art of floral design by creating a simple corsage or floral arrangement.</li></ol>
4. Describe landscape horticulture. <sup>DOK 4</sup> <ol style="list-style-type: none"><li>Explain nursery production and describe the types of plants grown for the nursery industry.<ul style="list-style-type: none"><li>Trees</li><li>Shrubs</li><li>Ground cover</li><li>Vines</li><li>Perennials</li></ul></li><li>Describe how nursery crops are sold in wholesale and retail markets.<ul style="list-style-type: none"><li>Balled and burlapped</li><li>Bare root</li><li>Containerized</li></ul></li><li>Describe landscaping and landscape architecture.</li><li>Design a landscape project.<ul style="list-style-type: none"><li>Scale drawing of the area to be landscaped</li><li>Estimated cost or budget for the project</li><li>List of plants and materials needed for the project</li><li>Installation of the project</li></ul></li></ol>

# Unit 11: Silviculture

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<b>Competencies and Suggested Objectives</b>
1. Describe modern forestry and forest products. <sup>DOK 1</sup>
2. Explain tree anatomy and identify the parts of a tree. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>List and explain the parts of a tree.</li><li>Describe how a tree grows.</li><li>Explain how trees reproduce.</li></ol>
3. Examine the major classes and types of forests. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Compare angiosperms to gymnosperms.</li><li>Contrast a pure stand of trees to a mixed stand of trees.</li><li>Explain how to identify trees based on visual characteristics.<ul style="list-style-type: none"><li>Leaves</li><li>Bark</li><li>Twigs</li><li>Flowers</li><li>Fruit</li></ul></li><li>Create a collection of leaves, fruit, and cones from 20 different local trees, identifying them by their common and scientific names.</li></ol>
4. Discuss silviculture and the protection of trees in our environment. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Explain the importance of protecting trees in urban areas.</li><li>Describe silvicultural practices that impact forest sustainability and health.<ul style="list-style-type: none"><li>Thinning</li><li>Intermediate cuttings</li><li>Liberation cuttings</li><li>Harvest cuttings</li></ul></li><li>Investigate the types of damage that could impact trees and/or forested areas.<ul style="list-style-type: none"><li>Forest fires</li><li>Insects and disease</li><li>Human activity</li><li>Weather</li><li>Large animals</li><li>Air pollution</li></ul></li></ol>

# Student Competency Profile

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**Student's Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Leadership and SAE for All</b>		
	1.	Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration.
	2.	Identify potential college and career opportunities in plant science.
	3.	Review the types of programs under SAE for All.
	4.	Review individual plans for student Foundational SAE.
	5.	Develop an Immersion SAE and maintain agricultural records.
<b>Unit 2: Seed Quality</b>		
	1.	Demonstrate general safety precautions for plant production enterprises.
	2.	Conduct a seed-quality evaluation on agronomic and horticultural crops.
<b>Unit 3: Plant Growth, Nutrition, and Fertilization</b>		
	1.	Demonstrate the role of air, water, light, and growing media in relation to plant growth.
	2.	Explain how fertilizers and soil amendments can be added to growing media to improve plant productivity.
<b>Unit 4: Greenhouse Management</b>		
	1.	Research the use of various plant-growing structures and their environmental control systems.
	2.	Create a management plan for a hydroponics growing system.
	3.	Discuss the benefits and uses of irrigation in plant production.
<b>Unit 5: Pest Management</b>		
	1.	Assess the effects of pests on plant production.
	2.	Examine concepts of plant pest management.
	3.	Describe the concept of integrated pest management (IPM) in plant production.
<b>Unit 6: Marketing in Plant Production</b>		
	1.	Investigate marketing practices used in crop and plant production.
	2.	Develop a crop management plan for a selected crop, including a marketing plan.

<b>Unit 7: Agronomic Crop Production</b>		
	1.	Identify the seeds and/or plants grown in agronomy with their crop and botanical names.
	2.	Explain the cultural practices required of selected agronomic crops.
	3.	Research applications of precision technology for plant production enterprises.
	4.	Analyze data captured by remote sensing technology and apply it to cultural precision-agriculture practices with a specific crop.
	5.	Assess specific crop conditions and formulate an irrigation plan for that crop.
<b>Unit 8: Turf and Forage Crop Production</b>		
	1.	Identify the seeds and/or plants grown in the forage and turfgrass industries by their crop and botanical names.
	2.	Explain the cultural practices required of selected forage and turf crops.
<b>Unit 9: Olericulture and Pomology</b>		
	1.	Compare the differences between olericulture (vegetable), pomology (fruit), and nut crops
	2.	Compare the cultural requirements for vegetable production.
	3.	Differentiate between the cultural requirements for fruit production.
	4.	Compare the cultural requirements for nut crop production.
	5.	Grow and/or manage a vegetable, fruit, or nut crop using the school greenhouse, garden, or local land area.
<b>Unit 10: Ornamental Horticulture</b>		
	1.	Describe ornamental horticulture.
	2.	Define floriculture and describe floral production.
	3.	Analyze how floral crops are distributed and processed.
	4.	Describe landscape horticulture.
<b>Unit 11: Silviculture</b>		
	1.	Describe modern forestry and forest products.
	2.	Explain tree anatomy and identify the parts of a tree.
	3.	Examine the major classes and types of forests.
	4.	Discuss silviculture and the protection of trees in our environment.

## Appendix: Industry Standards

### Framework for AFNR Content Standards and Performance Elements Crosswalk for Diversified Agriculture Plants Core

	Unit	1	2	3	4	5	6	7	8	9	10	11
AFNR												
ABS- Agribusiness Systems		X	X	X	X		X				X	
AS- Animal Systems												
BS- Biotechnology			X									
CRP- Career Ready Practices		X	X	X	X	X	X	X	X	X	X	X
CS- AFNR Cluster Skill		X	X	X	X	X	X	X	X	X	X	X
ES- Environmental Service Systems			X	X	X	X						X
FPP- Food Products and Processing Systems												
NRS- Natural Resource Systems			X	X	X	X						X
PS- Plant Systems		X	X	X	X	X	X	X	X	X	X	X
PST- Power, Structural, and Technical Systems												

### AFNR Pathway Content Standards and Performance Elements

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**ABS AGRIBUSINESS SYSTEMS**  
**AS ANIMAL SYSTEMS**  
**BS BIOTECHNOLOGY**  
**CRP CAREER READY PRACTICES**  
**CS AGRICULTURE FOOD AND NATURAL RESOURCES CLUSTER SKILL**  
**ES ENVIRONMENTAL SERVICE SYSTEMS**  
**FPP FOOD PRODUCTS AND PROCESSING SYSTEMS**  
**NRS NATURAL RESOURCE SYSTEMS**  
**PS PLANT SYSTEMS**  
**PST POWER, STRUCTURAL, AND TECHNICAL SYSTEMS**

## Agribusiness Systems Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), and business planning, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agribusiness Systems (AG-ABS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ABS.01. CCTC Standard:** Apply management planning principles in AFNR businesses.

**ABS.01.01. Performance Indicator:** Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.

**ABS.01.02. Performance Indicator:** Read, interpret, evaluate and write statements of purpose to guide business goals, objectives and resource allocation.

**ABS.01.03. Performance Indicator:** Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.

**ABS.01.04. Performance Indicator:** Evaluate, develop and implement procedures used to recruit, train and retain productive human resources for AFNR businesses.

**ABS.02. CCTC Standard:** Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

**ABS.02.01. Performance Indicator:** Apply fundamental accounting principles, systems, tools and applicable laws and regulations to record, track and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

**ABS.02.02. Performance Indicator:** Assemble, interpret and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash-flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

**ABS.03. CCTC Standard:** Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

**ABS.03.01. Performance Indicator:** Develop, assess and manage cash budgets to achieve AFNR business goals.



**ABS.03.02. Performance Indicator:** Analyze credit needs and manage credit budgets to achieve AFNR business goals.

**ABS.04. CCTC Standard:** Develop a business plan for an AFNR business.

**ABS.04.01. Performance Indicator:** Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

**ABS.04.02. Performance Indicator:** Develop production and operational plans for an AFNR business.

**ABS.04.03. Performance Indicator:** Identify and apply strategies to manage or mitigate risk.

**ABS.05. CCTC Standard:** Use sales and marketing principles to accomplish AFNR business objectives.

**ABS.05.01. Performance Indicator:** Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.

**ABS.05.02. Performance Indicator:** Assess and apply sales principles and skills to accomplish AFNR business objectives.

**ABS.05.03. Performance Indicator:** Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

## Animal Systems Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, and management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Animal Systems (AG-AS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**AS.01. CCTC Standard:** Analyze historic and current trends impacting the animal systems industry.

**AS.01.01. Performance Indicator:** Evaluate the development and implications of animal origin, domestication and distribution on production practices and the environment.

**AS.01.02. Performance Indicator:** Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.

- AS.01.03. Performance Indicator:** Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.
- AS.02. CCTC Standard:** Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.
- AS.02.01. Performance Indicator:** Demonstrate management techniques that ensure animal welfare.
- AS.02.02. Performance Indicator:** Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).
- AS.03. CCTC Standard:** Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.
- AS.03.01. Performance Indicator:** Analyze the nutritional needs of animals.
- AS.03.02 Performance Indicator:** Analyze feed rations and assess if they meet the nutritional needs of animals.
- AS.03.03 Performance Indicator:** Utilize industry tools to make animal nutrition decisions.
- AS.04. CCTC Standard:** Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.
- AS.04.01. Performance Indicator:** Evaluate animals for breeding readiness and soundness.
- AS.04.02. Performance Indicator:** Apply scientific principles to select and care for breeding animals.
- AS.04.03 Performance Indicator:** Apply scientific principles to breed animals.
- AS.05. CCTC Standard:** Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.
- AS.05.01. Performance Indicator:** Design animal housing, equipment and handling facilities for the major systems of animal production.
- AS.05.02. Performance Indicator:** Comply with government regulations and safety standards for facilities used in animal production.
- AS.06. CCTC Standard:** Classify, evaluate and select animals based on anatomical and physiological characteristics.
- AS.06.01. Performance Indicator:** Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).
- AS.06.02. Performance Indicator:** Apply principles of comparative anatomy and physiology to uses within various animal systems.
- AS.06.03. Performance Indicator:** Select and train animals for specific purposes and maximum performance based on anatomy and physiology.
- AS.07. CCTC Standard:** Apply principles of effective animal health care.
- AS.07.01. Performance Indicator:** Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

**AS.07.02. Performance Indicator:** Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

**AS.08. CCTC Standard:** Analyze environmental factors associated with animal production.

**AS.08.01. Performance Indicator:** Design and implement methods to reduce the effects of animal production on the environment.

**AS.08.02. Performance Indicator:** Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

## Common Career Technical Core Career Ready Practices Content Standards

The CCTC CRPs encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical-thinking, problem solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

**DEFINITIONS:** Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for CRPs from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a CTE program of study.

**CRP.01. CCTC Standard:** Act as a responsible and contributing citizen and employee.

**CRP.01.01. Performance Indicator:** Model personal responsibility in the workplace and community.

**CRP.01.02 Performance Indicator:** Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.

**CRP.01.03. Performance Indicator:** Identify and act upon opportunities for professional and civic service at work and in the community.

**CRP.02. CCTC Standard:** Apply appropriate academic and technical skills.

**CRP.02.01. Performance Indicator:** Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

**CRP.02.02. Performance Indicator:** Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

**CRP.03. CCTC Standard:** Attend to personal health and financial well-being.

**CRP.03.01. Performance Indicator:** Design and implement a personal wellness plan.

**CRP.03.02. Performance Indicator:** Design and implement a personal financial management plan.

**CRP.04. CCTC Standard:** Communicate clearly, effectively and with reason.

**CRP.04.01. Performance Indicator:** Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

**CRP.04.02. Performance Indicator:** Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

**CRP.04.03. Performance Indicator:** Model active listening strategies when interacting with others in formal and informal settings.

**CRP.05. CCTC Standard:** Consider the environmental, social and economic impacts of decisions.

**CRP.05.01. Performance Indicator:** Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.

**CRP.05.02. Performance Indicator:** Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

**CRP.06. CCTC Standard:** Demonstrate creativity and innovation.

**CRP.06.01. Performance Indicator:** Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

**CRP.06.02. Performance Indicator:** Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

**CRP.06.03. Performance Indicator:** Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

**CRP.07. CCTC Standard:** Employ valid and reliable research strategies.

**CRP.07.01. Performance Indicator:** Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

**CRP.07.02. Performance Indicator:** Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

**CRP.08. CCTC Standard:** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP.08.01. Performance Indicator:** Apply reason and logic to evaluate workplace and community situations from multiple perspectives.

**CRP.08.02. Performance Indicator:** Investigate, prioritize and select solutions to solve problems in the workplace and community.

**CRP.08.03. Performance Indicator:** Establish plans to solve workplace and community problems and execute them with resiliency.

**CRP.09. CCTC Standard:** Model integrity, ethical leadership and effective management.

**CRP.09.01. Performance Indicator:** Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

**CRP.09.02. Performance Indicator:** Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

**CRP.09.03. Performance Indicator:** Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

**CRP.10. CCTC Standard:** Plan education and career path aligned to personal goals.

**CRP.10.01. Performance Indicator:** Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

**CRP.10.02. Performance Indicator:** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

**CRP.10.03. Performance Indicator:** Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

**CRP.10.04. Performance Indicator:** Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

**CRP.11. CCTC Standard:** Use technology to enhance productivity.

**CRP.11.01. Performance Indicator:** Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

**CRP.11.02. Performance Indicator:** Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.

**CRP.12. CCTC Standard:** Work productively in teams while using cultural/global competence.

**CRP.12.01. Performance Indicator:** Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

**CRP.12.02. Performance Indicator:** Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

## **Agriculture, Food, and Natural Resources Cluster Skill Content Standards**

The AFNR Cluster Skills (CS) encompasses the study of fundamental knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career

pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agriculture, Food and Natural Resources Career Cluster® (AG) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**CS.01. CCTC Standard:** Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

**CS.01.01. Performance Indicator:** Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

**CS.01.02. Performance Indicator:** Examine technologies and analyze their impact on AFNR systems.

**CS.01.03. Performance Indicator:** Identify public policies and examine their impact on AFNR systems.

**CS.02. CCTC Standard:** Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

**CS.02.01. Performance Indicator:** Research and use geographic and economic data to solve problems in AFNR systems.

**CS.02.02. Performance Indicator:** Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

**CS.03. CCTC Standard:** Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

**CS.03.01. Performance Indicator:** Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.

**CS.03.02. Performance Indicator:** Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

**CS.03.03. Performance Indicator:** Apply health and safety practices to AFNR workplaces.

**CS.03.04. Performance Indicator:** Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

- CS.04. CCTC Standard:** Demonstrate stewardship of natural resources in AFNR activities.
- CS.04.01. Performance Indicator:** Identify and implement practices to steward natural resources in different AFNR systems.
- CS.04.02. Performance Indicator:** Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.
- CS.05. CCTC Standard:** Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
- CS.05.01. Performance Indicator:** Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).
- CS.06. CCTC Standard:** Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.
- CS.06.01. Performance Indicator:** Examine and explain foundational cycles and systems of AFNR.
- CS.06.02. Performance Indicator:** Analyze and explain the connection and relationships between different AFNR systems on a national and global level.

## Biotechnology Systems Career Pathway Content Standards

The Biotechnology Systems (BS) Career Pathway encompasses the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- **National Council for Agricultural Education (NCAE) Standard\*** – These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying biotechnology to AFNR systems.
  - **Performance Indicators** – These statements distill each performance element into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related performance element at the conclusion of a program of study in this area.
- BS.01. NCAE Standard:** Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).
- BS.01.01. Performance Indicator:** Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).

**BS.01.02. Performance Indicator:** Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).

**BS.01.03. Performance Indicator:** Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

**BS.02. NCAE Standard:** Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

**BS.02.01. Performance Indicator:** Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.

**BS.02.02. Performance Indicator:** Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.

**BS.02.03. Performance Indicator:** Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

**BS.02.04. Performance Indicator:** Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

**BS.02.05. Performance Indicator:** Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

**BS.03. NCAE Standard:** Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

**BS.03.01. Performance Indicator:** Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

**BS.03.02. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

**BS.03.03. Performance Indicator:** Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

**BS.03.04. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

**BS.03.05. Performance Indicator:** Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).

**BS.03.06. Performance Indicator:** Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

## Environmental Service Systems Career Pathway Content Standards



The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Environmental Service Systems (AG-ESS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ESS.01. CCTC Standard:** Use analytical procedures and instruments to manage environmental service systems.

**ESS.01.01. Performance Indicator:** Analyze and interpret laboratory and field samples in environmental service systems.

**ESS.01.02. Performance Indicator:** Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

**ESS.02. CCTC Standard:** Evaluate the impact of public policies and regulations on environmental service system operations.

**ESS.02.01. Performance Indicator:** Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.

**ESS.02.02. Performance Indicator:** Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).

**ESS.02.03. Performance Indicator:** Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

**ESS.03. CCTC Standard:** Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

**ESS.03.01. Performance Indicator:** Apply meteorology principles to environmental service systems.

**ESS.03.02. Performance Indicator:** Apply soil science and hydrology principles to environmental service systems.

**ESS.03.03. Performance Indicator:** Apply chemistry principles to environmental service systems.

**ESS.03.04. Performance Indicator:** Apply microbiology principles to environmental service systems.

**ESS.03.05. Performance Indicator:** Apply ecology principles to environmental service systems.

**ESS.04. CCTC Standard:** Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

**ESS.04.01. Performance Indicator:** Use pollution control measures to maintain a safe facility and environment.

**ESS.04.02. Performance Indicator:** Manage safe disposal of all categories of solid waste in environmental service systems.

**ESS.04.03. Performance Indicator:** Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

**ESS.04.04. Performance Indicator:** Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.

**ESS.05. CCTC Standard:** Use tools, equipment, machinery and technology common to tasks in environmental service systems.

**ESS.05.01. Performance Indicator:** Use technological and mathematical tools to map land, facilities and infrastructure for environmental service systems.

**ESS.05.02. Performance Indicator:** Perform assessments of environmental conditions using equipment, machinery and technology.

## **Food Products and Processing Systems Career Pathway Content Standards**

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety and sanitation; nutrition, biology, microbiology, chemistry and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Food Products and Processing Systems (AG-FPP) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to

demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**FPP.01. CCTC Standard:** Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

**FPP.01.01. Performance Indicator:** Analyze and manage operational and safety procedures in food products and processing facilities.

**FPP.01.02. Performance Indicator:** Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

**FPP.01.03. Performance Indicator:** Apply food safety procedures when storing food products to ensure food quality.

**FPP.02. CCTC Standard:** Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

**FPP.02.01. Performance Indicator:** Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.02. Performance Indicator:** Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.03. Performance Indicator:** Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.03. CCTC Standard:** Select and process food products for storage, distribution and consumption.

**FPP.03.01. Performance Indicator:** Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

**FPP.03.02. Performance Indicator:** Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

**FPP.03.03. Performance Indicator:** Create food distribution plans and procedures to ensure safe delivery of food products.

**FPP.04. CCTC Standard:** Explain the scope of the food industry and the historical and current developments of food product and processing.

**FPP.04.01. Performance Indicator:** Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

**FPP.04.02. Performance Indicator:** Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

**FPP.04.03. Performance Indicator:** Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

## Natural Resource Systems Career Pathway Content Standards

The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of natural resource systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Natural Resource Systems (AG-NRS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**NRS.01. CCTC Standard:** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

**NRS.01.01. Performance Indicator:** Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.

**NRS.01.02. Performance Indicator:** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.

**NRS.01.03. Performance Indicator:** Apply ecological concepts and principles to atmospheric natural resource systems.

**NRS.01.04. Performance Indicator:** Apply ecological concepts and principles to aquatic natural resource systems.

**NRS.01.05. Performance Indicator:** Apply ecological concepts and principles to terrestrial natural resource systems.

**NRS.01.06. Performance Indicator:** Apply ecological concepts and principles to living organisms in natural resource systems.

**NRS.02. CCTC Standard:** Analyze the interrelationships between natural resources and humans.

**NRS.02.01. Performance Indicator:** Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).

**NRS.02.02. Performance Indicator:** Assess the impact of human activities on the availability of natural resources.

**NRS.02.03. Performance Indicator:** Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.

**NRS.02.04. Performance Indicator:** Examine and explain how economics affects the use of natural resources.

**NRS.02.05. Performance Indicator:** Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

**NRS.03. CCTC Standard:** Develop plans to ensure sustainable production and processing of natural resources.

**NRS.03.01. Performance Indicator:** Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

**NRS.03.02. Performance Indicator:** Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

**NRS.04. CCTC Standard:** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

**NRS.04.01. Performance Indicator:** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

**NRS.04.02. Performance Indicator:** Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

**NRS.04.03. Performance Indicator:** Prevent or manage introduction of ecologically harmful species in a particular region.

**NRS.04.04. Performance Indicator:** Manage fires in natural resource systems.

## Plant Science Systems Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Plant Systems (AG-PS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

- PS.01. CCTC Standard:** Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- PS.01.01. Performance Indicator:** Determine the influence of environmental factors on plant growth.
- PS.01.02. Performance Indicator:** Prepare and manage growing media for use in plant systems.
- PS.01.03. Performance Indicator:** Develop and implement a fertilization plan for specific plants or crops.
- PS.02. CCTC Standard:** Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.01. Performance Indicator:** Classify plants according to taxonomic systems.
- PS.02.02. Performance Indicator:** Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Performance Indicator:** Apply knowledge of plant physiology and energy conversion to plant systems.
- PS.03. CCTC Standard:** Propagate, culture and harvest plants and plant products based on current industry standards.
- PS.03.01. Performance Indicator:** Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Performance Indicator:** Develop and implement a management plan for plant production.
- PS.03.03. Performance Indicator:** Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Performance Indicator:** Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Performance Indicator:** Harvest, handle and store crops according to current industry standards.
- PS.04. CCTC Standard:** Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- PS.04.01. Performance Indicator:** Evaluating, identifying and preparing plants to enhance an environment.
- PS.04.02. Performance Indicator:** Create designs using plants.

## Power, Structural and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Power, Structural and Technical Systems (AG-PST) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**PST.01. CCTC Standard:** Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

**PST.01.01. Performance Indicator:** Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.

**PST.01.02. Performance Indicator:** Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.

**PST.01.03. Performance Indicator:** Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).

**PST.02. CCTC Standard:** Operate and maintain AFNR mechanical equipment and power systems.

**PST.02.01. Performance Indicator:** Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.

**PST.02.02. Performance Indicator:** Operate machinery and equipment while observing all safety precautions in AFNR settings.

**PST.03. CCTC Standard:** Service and repair AFNR mechanical equipment and power systems.

**PST.03.01. Performance Indicator:** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.

**PST.03.02. Performance Indicator:** Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.

**PST.03.03. Performance Indicator:** Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

**PST.04. CCTC Standard:** Plan, build and maintain AFNR structures.

**PST.04.01. Performance Indicator:** Create sketches and plans for AFNR structures.

**PST.04.02. Performance Indicator:** Determine structural requirements, specifications and estimate costs for AFNR structures

**PST.04.03. Performance Indicator:** Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).

**PST.04.04. Performance Indicator:** Apply electrical wiring principles in AFNR structures.

**PST.05. CCTC Standard:** Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.

**PST.05.01. Performance Indicator:** Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

**PST.05.02. Performance Indicator:** Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.

**PST.05.03. Performance Indicator:** Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.







## 2022 Diversified Agriculture Animals Core

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE diversified agriculture animals core curriculum is aligned to the following standards:

## **National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards**

The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in Grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted by the National Council for Agricultural Education and are used with permission.

[thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr)

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oe/college-and-career-readiness-standards](http://mdek12.org/oe/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.



# Executive Summary

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## Pathway Description

The diversified agriculture animals core curriculum is a one-Carnegie unit course within the four-credit diversified agriculture program. All students must complete the principles of agriscience course before being allowed to enroll in the diversified agriculture animals core course. The course is a culmination of in-depth study in the production, management, and evaluation of livestock based upon intended use. The course also addresses livestock facilities and management and guides students to research current issues in animal agriculture. Emphasis is on an active learning environment enriched with technology and hands-on, science-based applications.

## College, Career, and Certifications

Beef Quality Assurance (BQA) is a national certification that has been cross walked to this curriculum. This certification is optional and can be taught and tested according to local district policies. Competencies and suggested performance indicators in this course have also been correlated to the AFNR Career Cluster Content Standards that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
3. Instructor approval and TABE reading score (eighth grade or higher)

**or**

1. TABE reading and math score (eighth grade or higher)
2. Instructor approval

**or**

1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Applied Academic Credit

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

### **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

### **Professional Learning**

If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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This curriculum consists of one 1-credit course.

## **Diversified Agriculture Animals Core—Course Code: 991001**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Leadership and SAE for All	5
2	Introduction to Animal Agriculture	15
3	Worker Safety, Biosecurity, and Emergency Management	10
4	Application of Feed and Feeding to Animal Growth and Production	15
5	Genetics	15
6	Animal Reproduction	20
7	Livestock Evaluation and Selection	20
8	Animal Production Management	15
9	Facility and Equipment Management in Animal Agriculture	10
10	Issues in Animal Agriculture	5
11	Business Management in Animal Agriculture	10
<b>Total</b>		<b>140</b>

## Career Pathway Outlook

The agricultural sciences career cluster covers the broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. According to the U.S. Department of Agriculture, during the next five years (2020-2025) 59,400 jobs are expected to open in food, agriculture, renewable natural resources, or the environment for graduates with bachelor's or higher degrees in those areas. Almost half of those jobs will be in management and business at 42%; 31% in science, technology, engineering, and math in agriculture; 13% in sustainable food and biomaterials production; and 14% in education, communication, and government services. According to USDA, agriculture, food, and related industries contributed \$1.109 trillion to the U.S. gross domestic product (GDP) in 2019. The Mississippi Department of Agriculture and Commerce reports that agriculture is Mississippi's number one industry at \$7.35 billion and employing approximately 17.4% of the state's workforce.

Diversified agriculture will target careers at the professional and technical levels in agriculture. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college levels.

### Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (2016). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Yearly Earnings, 2020
Agricultural and Food Science Technicians	260	270	10	3.9%	\$39,270
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	\$93,260
Animal Trainers	100	110	10	10%	\$23,120
Career/Technical Education Teachers, Middle School	320	350	30	9.4%	\$47,270
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	\$50,370
Conservation Scientists	700	730	30	4.3%	\$54,950
Environmental Engineers	410	420	10	2.4%	\$75,940
Environmental Engineering Technicians	160	170	10	6.3%	\$46,790
Environmental Scientists and Specialists, Including Health	620	670	50	8.1%	\$64,460

Environmental Science and Protection Technicians, Including Health	420	460	40	9.5%	\$38,780
Farm and Home Management Advisors	290	300	10	3.2%	\$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	\$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	\$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	\$24,030
Soil and Plant Scientists	110	110	0	0%	\$92,250
Farmers, Ranchers, and Other Agricultural Managers	1,790	1,840	20	2.8%	\$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2%	\$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	\$54,550
Fish and Game Wardens	40	40	0	0%	\$46,610
Foresters	190	200	10	5.3%	\$52,660
Surveyors	450	470	20	4.4%	\$48,600
Surveying and Mapping Technicians	530	550	20	3.8%	\$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	\$44,920
Veterinarians	490	540	50	10.2%	\$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1,090	120	12.4%	\$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	\$35,890
Zoologists and Wildlife Biologists	260	270	10	3.9%	\$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

### **Perkins V Requirements and Academic Infusion**

The diversified agriculture animals core curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for careers in agriculture. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

### **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## Best Practices

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The diversified agriculture educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the diversified agriculture curriculum. FFA provides students with growth opportunities and competitive events and opens the doors to the world of agriculture and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The diversified agriculture curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the curriculum that will allow and encourage collaboration with professionals currently in the agriscience field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the diversified agriculture classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and agriscience professionals. Thus, supervised collaboration and immersion into the agriculture industry around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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American Association for Agricultural Education (AAAE)

[aaaeonline.org](http://aaaeonline.org)

Association for Career and Technical Education (ACTE)

[acteonline.org](http://acteonline.org)

Mississippi ACTE

[mississippiacte.com](http://mississippiacte.com)

Mississippi FFA/ Mississippi Association of Vocational Agriculture Teachers (MAVAT)

[mississippiffa.org](http://mississippiffa.org)

National FFA Organization

[ffa.org](http://ffa.org)

National Association of Agricultural Educators (NAAE)

[naae.org](http://naae.org)



# Using This Document

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## Competencies and Suggested Objectives

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## Teacher Resources

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## Perkins V Quality Indicators and Enrichment Material

Some of the units may include an enrichment section at the end. If the diversified agriculture animals core program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the diversified agriculture animals core program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Leadership and SAE for All

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## Competencies and Suggested Objectives

1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. <sup>DOK3</sup>

- a. Actively participate in FFA activities.
  - Leadership Development Events (LDE)
  - Career Development Events (CDE)
    - Dairy Cattle Evaluation and Management
    - Dairy Cattle Handlers Activity
    - Horse Evaluation
    - Livestock Evaluation
    - Meats Evaluation and Technology
    - Poultry Evaluation
    - Veterinary Science
  - Livestock shows
  - Premier exhibitor event
  - Leadership retreats or conferences
  - Industry-related seminars, workshops, or conferences
  - Other related FFA activities

2. Identify potential college and career opportunities in animal agriculture. <sup>DOK2</sup>

- a. Research postsecondary institutions that offer studies in animal agriculture or a related field and prepare a two- to three-minute speech on their programs and potential career choices.
- b. Complete applications for college admission and scholarships.
- c. Revise a personal résumé for the purpose of applying for a specific job.
- d. Complete a job application for employment.
- e. Participate in a mock or real interview.

3. Review the types of programs under Supervised Agricultural Experience (SAE) for All. <sup>DOK1</sup>

- a. Explore concepts of a Foundational SAE.
  - Career exploration and planning
  - Employability skills for college and career readiness
  - Personal financial management and planning
  - Workplace safety
  - Agricultural literacy
- b. Explore concepts of an Immersion SAE.
  - Placement/internship
  - Ownership/entrepreneurship
  - Research
    - Experimental

<ul style="list-style-type: none"> <li>○ Analytical</li> <li>○ Invention</li> <li>● School-based enterprise</li> <li>● Service learning</li> </ul>
<p>4. Review individual plans for student Foundational SAE programs. <sup>DOK2</sup></p> <ul style="list-style-type: none"> <li>a. Assess goal attainment in SAE from the previous year.</li> <li>b. Review and update short- and long-range goals pertaining to the SAE program.</li> </ul>
<p>5. Develop an Immersion SAE and maintain agricultural records. <sup>DOK2</sup></p> <ul style="list-style-type: none"> <li>a. Redefine and adjust requirements of agreements between the student, parents, supervisor, and/or employer.</li> <li>b. Utilize an electronic/computer-based system of record keeping.</li> <li>c. Update SAE records. <ul style="list-style-type: none"> <li>● SAE program goals</li> <li>● Student inventory related to the SAE program</li> <li>● Expense records</li> <li>● Income/gift and scholarship records</li> <li>● Skill-attainment records</li> <li>● Leadership-activity records and participation in FFA activities</li> <li>● Community service hours</li> </ul> </li> <li>d. Complete degree and proficiency award applications as they apply to the SAE.</li> </ul>

## Unit 2: Introduction to Animal Agriculture

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### Competencies and Suggested Objectives

1. Investigate the nature of animal agriculture and its associated enterprises. <sup>DOK1</sup>
  - a. Describe the importance of agricultural animals to people.
  - b. Identify the major animal enterprises.
    - Beef cattle
    - Dairy cattle
    - Horses
    - Swine
    - Poultry
    - Aquaculture
    - Goats and sheep
    - Companion animals
  - c. Identify careers in the agriculture industry and the skills required by employers.
    - Livestock producer
    - Veterinarian
    - Reproductive specialist
    - Nutritionist
    - Animal-health sales/marketing
    - Rodeo stock contractor
2. Discuss the beef cattle industry. <sup>DOK1</sup>
  - a. Identify products produced from beef cattle.
    - Meat
    - By-products (edible/nonedible)
  - b. Discuss beef cattle enterprises.
    - Cow-calf operation
    - Purebred herd
    - Stocker cattle
    - Feedlot
  - c. Identify beef cattle breeds.
    - Angus
    - Hereford
    - Brahman
    - Brangus
    - Charolais
    - Simmental
    - Limousin
    - Santa Gertrudis
    - Texas Longhorn

3. Discuss the dairy cattle industry. <sup>DOK1</sup>
- a. Identify products produced from dairy cattle.
    - Milk
    - Milk by-products (e.g., butter, cheese, yogurt, ice cream, etc.)
    - Meat
  - b. Discuss dairy cattle enterprises.
    - Milk production
    - Heifer development
  - c. Identify dairy cattle breeds.
    - Jersey
    - Holstein
    - Guernsey
    - Brown Swiss
    - Ayrshire

4. Discuss the equine industry. <sup>DOK1</sup>
- a. Identify uses for horses.
    - Work
    - Pleasure
    - Companion
    - Recreation
  - b. Discuss equine enterprises.
    - Breeders
    - Trainers
    - Boarding
  - c. Identify horse breeds.
    - Quarter horse
    - Appaloosa
    - Thoroughbred
    - Clydesdale
    - Arabian
    - Shetland ponies

5. Discuss the swine industry. <sup>DOK1</sup>
- a. Identify products produced from swine.
    - Meat
    - By-products (edible/nonedible)
  - b. Discuss swine enterprises.
    - Farrowing
    - Nursery
    - Feeder pig
    - Breeding
    - Finishing
  - c. Identify swine breeds.
    - Duroc

- Yorkshire
- Hampshire
- Chester White
- Spot

6. Discuss the poultry industry. <sup>DOK1</sup>

- Identify products produced from poultry.
  - Meat
  - Eggs
  - By-products
- Discuss poultry enterprises.
  - Layers
  - Broiler production
  - Backyard flocks
  - Turkey production
  - Game bird production
- Identify breeds of poultry.
  - Leghorns
  - Plymouth Rock
  - Rhode Island Red

7. Discuss the aquaculture industry. <sup>DOK1</sup>

- Identify products produced from aquaculture.
  - Meat
  - By-products
- Discuss aquaculture enterprises.
  - Fish
  - Shellfish
  - Alligators
  - Frogs
- Identify aquaculture species.
  - Catfish
  - Crawfish
  - Tilapia
  - Shrimp/prawn

8. Discuss the goat industry. <sup>DOK1</sup>

- Identify products produced from goats.
  - Meat
  - Milk
  - Fiber
  - By-products
- Discuss goat enterprises.
  - Market goats
  - Dairy goats
  - Companion goats

<p>c. Identify goat breeds.</p> <ul style="list-style-type: none"> <li>• Boer</li> <li>• Kiko</li> <li>• Nubian</li> <li>• Lamancha</li> <li>• Pygmy</li> </ul>
<p>9. Discuss the sheep industry. <sup>DOK1</sup></p> <p>a. Identify products produced from sheep.</p> <ul style="list-style-type: none"> <li>• Meat</li> <li>• Fiber</li> <li>• By-products</li> </ul> <p>b. Discuss sheep enterprises.</p> <ul style="list-style-type: none"> <li>• Farm flocks</li> <li>• Purebred operations</li> </ul> <p>c. Identify sheep breeds.</p> <ul style="list-style-type: none"> <li>• Dorper</li> <li>• Katahdin</li> <li>• Suffolk</li> <li>• Dorset</li> <li>• Hampshire</li> <li>• Rambouillet</li> </ul>
<p>10. Conduct an in-depth investigation of an animal industry in your area that provides opportunities for hands-on experience while developing workplace skills. <sup>DOK3</sup></p>

## Unit 3: Worker Safety, Biosecurity, and Emergency Management

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<b>Competencies and Suggested Objectives</b>
<p>1. Investigate workplace safety and the use of personal protective equipment (PPE). <sup>DOK1</sup></p> <ul style="list-style-type: none"><li>a. Describe safe practices when using equipment, handling livestock, handling animal health products, and working around potentially hazardous areas.</li><li>b. Explore safety scenarios within the animal industry.<ul style="list-style-type: none"><li>• Manure pits</li><li>• Fumes in areas with poor or no ventilation</li><li>• Health product and pesticide handling/storage</li><li>• Injuries from handling animals</li></ul></li></ul>
<p>2. Develop and maintain an emergency action plan (EAP) for working in animal agriculture. <sup>DOK3</sup></p> <ul style="list-style-type: none"><li>a. Develop an EAP with the necessary information in the event of an emergency. Name of site<ul style="list-style-type: none"><li>• Premise identification number (PIN)</li><li>• Owner/operator name</li><li>• Farm Services Agency (FSA) number</li><li>• Global Positioning System (GPS) coordinates</li><li>• Physical address of the site (911 address)</li><li>• Directions to the nearest town</li><li>• Important telephone numbers and contact information<ul style="list-style-type: none"><li>○ Veterinarian</li><li>○ Police</li><li>○ Fire</li><li>○ Doctor</li><li>○ Poison control</li><li>○ Utilities</li><li>○ Local emergency management agency</li></ul></li></ul></li></ul>
<p>3. Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Define the term biosecurity and its effect on animal agriculture.</li><li>b. Investigate biosecurity practices for animal agriculture:<ul style="list-style-type: none"><li>• Disease containment</li><li>• Sanitation</li><li>• Livestock management</li><li>• Preventing infectious disease from entering operations</li><li>• Controlling microbial contamination</li><li>• Water contamination</li><li>• Pest control</li></ul></li></ul>
<p><b>Note:</b> Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.</p>



## Unit 4: Application of Feed and Feeding to Animal Growth and Production

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### Competencies and Suggested Objectives

1. Investigate the role of the animal digestive system in growth and nutrition. <sup>DOK1</sup>
  - a. Describe a monogastric digestive system.
  - b. Describe a ruminant digestive system.
    - Rumen
    - Reticulum
    - Omasum
    - Abomasum
  - c. Describe a pseudoruminant digestive system (i.e., cecum).
  - d. Describe an avian digestive system (i.e., crop, gizzard).
  - e. Describe a fish's digestive system (i.e., stomach, intestines).
2. Examine the role of nutrition in animal growth and health at different life stages. <sup>DOK2</sup>
  - a. Explain metabolism.
  - b. List six nutrients essential to life and how they are used to meet the nutritional requirements of animals.
    - Proteins
    - Carbohydrates
    - Fats
    - Vitamins
      - Fat-soluble (e.g., A, D, E, K)
      - Water-soluble (e.g., B, C)
    - Minerals
      - Macro (e.g., Ca P, Na, Cl)
      - Micro
    - Water (source and quality)
  - c. Define common terms associated with feed and feeding.
    - Feedstuffs
    - Concentrates
    - Roughages
    - Rations
    - Total Digestible Nutrients (TDN)
    - Crude protein
    - Dry matter
  - d. Distinguish between different sources of nutrients found in concentrates and roughages associated with various animal rations.
    - Plant sources (e.g., corn, soybean meal, cotton seed meal, hay)
    - Animal sources (e.g., bone meal, fish meal, feather meal)
    - Synthetic sources (e.g., urea)
  - e. Explain the role of microorganisms in ruminants in increasing feed utilization.

<p>3. Explain the role of nutrition in agricultural animal production. <sup>DOK3</sup></p> <ol style="list-style-type: none"> <li>a. Determine the available/appropriate feedstuffs that meet the nutrient requirements of various types of livestock. <ul style="list-style-type: none"> <li>• Beef cattle</li> <li>• Dairy cattle</li> <li>• Horses</li> <li>• Sheep</li> <li>• Goats</li> <li>• Swine</li> <li>• Poultry</li> <li>• Aquaculture crops</li> </ul> </li> <li>b. Determine the nutritional requirements of a class of livestock based on production purposes. <ul style="list-style-type: none"> <li>• Growth</li> <li>• Maintenance</li> <li>• Reproduction</li> <li>• Production</li> <li>• Lactation</li> <li>• Work</li> </ul> </li> </ol>
<p>4. Explain how animals are fed. <sup>DOK3</sup></p> <ol style="list-style-type: none"> <li>a. Describe how a feed ration is formulated.</li> <li>b. Calculate feed rations using the Pearson square.</li> <li>c. Interpret an ingredient label from a bag of livestock feed.</li> <li>d. Distinguish between feed additives and feed supplements.</li> <li>e. Calculate a least-cost formulation for feeding livestock.</li> <li>f. Interpret a hay sample report.</li> </ol>
<p>5. Describe the various types of feeding systems used in livestock production (e.g., hand-fed, free choice/ad libidum, creep feed). <sup>DOK1</sup></p>
<p>6. Discuss forage management systems that emphasize production and utilization by ruminants and pseudoruminants. <sup>DOK2</sup></p> <ol style="list-style-type: none"> <li>a. Compare cool-season and warm-season grasses.</li> <li>b. Describe grazing systems (e.g., continuous, rotational, intense).</li> <li>c. Determine carrying capacity.</li> <li>d. Discuss the utilization and management of harvested forages (e.g., hay, haylage, silage).</li> </ol>

## Unit 5: Genetics

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### Competencies and Suggested Objectives

1. Discuss the application of heredity and genetics in animal production. <sup>DOK1</sup>
  - a. Investigate the importance of heredity and genetics.
  - b. Define terms related to genetics and heredity.
    - Genes
    - Chromosomes
    - Mutations
    - Inherited traits
    - Dominant
    - Recessive
    - Codominant
    - Heterozygous
    - Homozygous
    - Alleles
    - Gametes
    - Genotypes
    - Phenotypes
2. Predict the transmission of a trait from parents to offspring using a Punnett square to complete a monohybrid and dihybrid cross. <sup>DOK2</sup>

## Unit 6: Animal Reproduction

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### Competencies and Suggested Objectives

1. Examine the process of reproduction in animal production. <sup>DOK1</sup>
  - a. Define common terms associated with animal reproduction.
    - Copulation
    - Estrus/heat
    - Conception
    - Gestation
    - Fertilization
    - Ovulation
    - Lactation
    - Parturition
    - Incubation
  - b. Describe the importance of reproduction and reproductive efficiency to animal enterprises.
  - c. Describe the process of fertilization.
2. Examine the reproduction process. <sup>DOK2</sup>
  - a. Identify the parts of the male and female reproductive systems and discuss the function of each part.
    - Male (i.e., penis, testicle, scrotum, epididymis, accessory glands)
    - Female (i.e., uterus, cervix, ovary, Fallopian tubes, vagina, vulva, infundibulum)
  - b. Discuss the male and female reproductive hormones.
    - Estrogen
    - Progesterone
    - Testosterone
  - c. Identify signs of estrus in various female agricultural animals.
    - Cattle
    - Horses
    - Sheep
    - Goats
    - Swine
  - d. Calculate the expected birth date for a given species based on conception date.
    - Cattle
    - Sheep
    - Goats
    - Swine
    - Horses
  - e. Identify and describe the function of the reproductive system in poultry.
    - Male (i.e., cloaca, vas deferens, testes)
    - Female (i.e., ovary, infundibulum, magnum, isthmus, uterus, vagina, cloaca, vent)

<ul style="list-style-type: none"> <li>f. Describe the reproductive process in poultry.</li> <li>g. Indicate incubation and hatching conditions, including humidity and temperature required by various species. <ul style="list-style-type: none"> <li>• Turkey</li> <li>• Chicken</li> <li>• Quail</li> </ul> </li> <li>h. Describe brooding for newly hatched chicks and poults.</li> <li>i. Describe the general process of spawning and incubation of Mississippi farm-raised catfish.</li> </ul>
<p>3. Investigate the use of breeding systems and genetic improvement techniques. <sup>DOK1</sup></p> <ul style="list-style-type: none"> <li>a. Describe various types of breeding systems. <ul style="list-style-type: none"> <li>• Purebred breeding system</li> <li>• Crossbreeding system</li> <li>• Maternal vs. terminal cross</li> </ul> </li> </ul>
<p>4. Determine which breeding system works best for specific animal enterprises. <sup>DOK2</sup></p> <ul style="list-style-type: none"> <li>a. Compare and contrast the types of mating systems. <ul style="list-style-type: none"> <li>• Natural</li> <li>• Hand-mated</li> <li>• Artificial insemination</li> <li>• Embryo transfer</li> </ul> </li> <li>b. Describe the application of estrus synchronization in breeding systems.</li> <li>c. Observe and describe the artificial insemination method of breeding.</li> <li>d. Observe and describe the procedure for collecting and processing semen.</li> <li>e. Observe and describe the procedure for conducting a breeding soundness exam.</li> <li>f. Observe and describe the process of embryo transfer.</li> <li>g. Discuss the male-to-female ratio (e.g., bull to cow) in a natural or hand-mated breeding program.</li> </ul>
<p>5. Discuss new scientific technology that will be of benefit to livestock producers. <sup>DOK1</sup></p> <ul style="list-style-type: none"> <li>a. Investigate technology and issues related to genetic engineering.</li> <li>b. Investigate research and technology as it applies to cloning in animal production.</li> <li>c. Discuss the pros and cons of using new technologies in animal production.</li> </ul>

## Unit 7: Livestock Evaluation and Selection

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<b>Competencies and Suggested Objectives</b>	
1.	Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for meat production or breeding purposes. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Describe the external parts of beef, dairy, horse, swine, goat, chicken, and lamb as they relate to selection and evaluation.<ul style="list-style-type: none"><li>Neck</li><li>Shoulder</li><li>Back</li><li>Loin</li><li>Hip/rump</li><li>Hock</li><li>Foot</li><li>Flank</li><li>Barrel</li></ul></li><li>Identify the wholesale meat cuts on a market animal.<ul style="list-style-type: none"><li>Beef: (e.g., chuck, rib, loin, round)</li><li>Lamb/goat: (e.g., shoulder, rack, loin, leg)</li><li>Swine: (e.g., picnic shoulder, Boston butt, loin, ham)</li><li>Chicken: (e.g., breast, thigh, wing, leg)</li></ul></li></ol>
2.	Investigate the selection of market animals. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Critique the main points to consider when visually evaluating a market animal.<ul style="list-style-type: none"><li>Type</li><li>Muscle</li><li>Finish</li><li>Carcass merit</li><li>Yield grade (i.e., 1, 2, 3, 4, 5)</li><li>Quality grade (i.e., prime, choice, select, standard)</li><li>Balance</li><li>Style</li><li>Structural correctness</li></ul></li><li>Evaluate classes of market animals and discuss placings for each class.</li><li>Develop logical reasoning for the selection of market, breeding, or performance livestock.</li><li>Explain how to improve livestock quality through selection.</li></ol>
3.	Describe the process of selecting breeding animals. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Define characteristics used in selecting various species of animals for breeding purposes.<ul style="list-style-type: none"><li>Structural soundness</li><li>Growth</li><li>Capacity</li></ul></li></ol>

<ul style="list-style-type: none"> <li>• Breed characteristics</li> <li>• Sex characteristics</li> <li>• Body condition</li> <li>• Muscle</li> </ul> <p>b. Explain the types of performance data used in selecting breeding animals.</p> <ul style="list-style-type: none"> <li>• Birth weight (BW)</li> <li>• Calving ease (CE)</li> <li>• Weaning weight (WW)</li> <li>• Yearling weight (YW)</li> <li>• Milk (M)</li> <li>• Back fat (BF)</li> <li>• Loin eye area (LEA) and ribeye area (REA)</li> <li>• Number born alive—sheep and swine</li> <li>• 21-day litter weight—swine</li> <li>• Days to 250 lbs.—swine</li> <li>• Expected progeny differences</li> <li>• Estimated breeding value</li> <li>• Term indexes <ul style="list-style-type: none"> <li>○ Sow productivity index—swine</li> <li>○ Terminal sire index—swine</li> <li>○ Maternal line index—swine</li> </ul> </li> </ul> <p>c. Evaluate various species of breeding animals and identify favorable characteristics for breeding in each animal.</p>
<p>4. Evaluate market livestock. <sup>DOK3</sup></p> <p>a. Apply concepts in selecting high-quality market animals.</p> <ul style="list-style-type: none"> <li>• Swine</li> <li>• Goats</li> <li>• Sheep</li> <li>• Beef cattle</li> <li>• Dairy cattle</li> <li>• Chickens</li> </ul> <p>b. Evaluate classes of market animals, placing them from highest quality to lowest quality, and present sound reasoning for placing the animals in their respective positions within the class.</p>
<p>5. Evaluate performance livestock. <sup>DOK3</sup></p> <p>a. Apply concepts in selecting high-quality performance animals.</p> <p>b. Evaluate classes of performance animals, placing them from highest quality to lowest quality, and present sound reasoning for placing the animals in their respective positions within the class.</p>

6. Evaluate breeding livestock. <sup>DOK3</sup>
  - a. Apply concepts in selecting high-quality animals for breeding.
  - b. Evaluate breeding animals based upon high-quality breeding characteristics and performance data that is distinctive to each species of agricultural-breeding animals and present sound reasoning for placing animals in their respective positions within their class.
  - c. Evaluate the classes of breeding animals and discuss the reasons for placing the animals in each class.



# Unit 8: Animal Production Management

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## Competencies and Suggested Objectives

1. Examine basic concepts of animal health, including disease prevention, control, and treatment. <sup>DOK1</sup>
  - a. Describe the signs of good health in animals.
  - b. Define disease and describe the major causes of diseases and their impact on animal health.
    - Infectious
      - Pathogens
        - Bacteria (contagious and noncontagious)
        - Viruses (contagious and noncontagious)
        - Protozoa
    - Noninfectious
      - Genetics
      - Poor nutrition
      - Toxins
      - Parasites (internal and external)
      - Injury
  - c. Discuss methods for delivering medicines to animals.
    - Injection (e.g., intramuscular, subcutaneous, IV)
    - Drenching
    - Pills/bolus/paste
    - Topical (e.g., powders, liquids, etc.)
    - Intramammary infusion
2. Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases. <sup>DOK2</sup>
  - a. Examine the effects of environmental conditions on animal health.
    - Temperature
    - Humidity
    - Air quality
    - Water source and quality
    - Light
  - b. Discuss the role and functions of white blood cells in the development of natural immunity.
  - c. Investigate the thermal neutral zone of beef cattle and how it affects animal performance (e.g., growth, reproduction, milk production).
  - d. Describe how vaccinations prevent disease.
  - e. Discuss practices that promote animal health.
    - Proper nutrition
    - Sanitation

<ul style="list-style-type: none"> <li>• Vaccination</li> <li>• Observation</li> <li>• Isolation</li> <li>• Biosecurity</li> </ul> <p>f. Demonstrate methods for delivering medicines to animals.</p> <ul style="list-style-type: none"> <li>• Injection (e.g., intramuscular, subcutaneous, IV)</li> <li>• Drenching</li> <li>• Pills/bolus/paste</li> <li>• Topical (e.g., powders, liquids, etc.)</li> <li>• Intramammary infusion</li> </ul>
<p>3. Observe and describe management and marketing practices for various animal enterprises.<sup>DOK3</sup></p> <p>a. Observe and assess critical practices in managing an animal enterprise.</p> <ul style="list-style-type: none"> <li>• Castration</li> <li>• Dehorning/disbudding</li> <li>• Semen testing</li> <li>• Identification (e.g., tagging, branding, ear notching)</li> <li>• Animal health practices (e.g., injections, tubing, etc.)</li> <li>• Breeding soundness exams</li> <li>• Pregnancy examination</li> </ul> <p>b. Analyze marketing practices for meat animals (e.g., cattle, swine, sheep).</p> <ul style="list-style-type: none"> <li>• On-farm sale</li> <li>• Public auction (e.g., sale barn, breeding sale, online)</li> <li>• Order buyer</li> <li>• Retained ownership</li> </ul>

## Unit 9: Facility and Equipment Management in Animal Agriculture

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<b>Competencies and Suggested Objectives</b>
<p>1. Explore facility, equipment, sales, and management needs for various animal enterprises. <sup>DOK3</sup></p> <ul style="list-style-type: none"><li>a. Research and discuss general facility needs for different classes of animals (e.g., shelter, feeding, birthing, watering, examining, etc.).</li><li>b. Participate in (and understand the concept of) a marketing practice for meat or breeding animals, such as a farm sale, a public auction, or with an order buyer.</li><li>c. Discuss biosecurity practices, animal welfare, humane treatment of animals, animal behavior, and proper restraint techniques to protect the health and safety of animals.</li><li>d. Demonstrate skills in building, repairing, and maintaining a safe, secure fenced area for agricultural animals.</li><li>e. Design and build a cage or hutch for small animals, such as chickens, rabbits, or quail, including a watering source and containers.</li></ul>
<p>2. Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock. <sup>DOK3</sup></p>
<p>3. Explore concepts of animal transportation. <sup>DOK1</sup></p> <ul style="list-style-type: none"><li>a. Review trailer safety practices and describe the process of verifying if a trailer is suitable for hauling livestock.</li><li>b. Investigate precautionary procedures in the event of accidents or rollovers.</li><li>c. Discuss appropriate handling practices when loading and unloading livestock.</li></ul>

## Unit 10: Issues in Animal Agriculture

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<b>Competencies and Suggested Objectives</b>	
1. Explore concepts of animal welfare and animal rights. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>a. Define the concepts of animal welfare and animal rights.</li><li>b. Discuss the practice of animal welfare and the implications of animal rights in animal production.</li></ol>
2. Examine consumer concerns and their effect on animal production. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>a. Examine how consumer concerns and preferences about food and nutrition have affected animal production enterprises.</li><li>b. Describe the role of quality assurance and safety in meat production today.</li><li>c. Investigate concerns about animal waste and its effect on the environment.</li><li>d. Identify and describe the role and function of government agencies in assisting animal producers in producing safe food products and protecting the environment.</li></ol>
3. Compare bioterrorism to biosecurity and discuss the effect each have on animal agriculture. <sup>DOK2</sup>	
4. Analyze public perceptions of animal production for human food consumption and complete a project on the findings. <sup>DOK3</sup>	

# Unit 11: Business Management in Animal Agriculture

## Competencies and Suggested Objectives

1. Explore banking services for personal and business accounts. <sup>DOK2</sup>
  - a. Identify common types of personal savings and checking options.
  - b. Create and maintain a transaction register.
  - c. Demonstrate how to write a check.
  - d. Demonstrate how to write a deposit slip.
  - e. Reconcile a bank statement.
  - f. Investigate online banking services, including online security, identity theft, and fraud-prevention procedures.
2. Explore concepts of credit. <sup>DOK2</sup>
  - a. Identify and compare sources of credit (e.g., credit card, bank, finance company, credit union, government agency).
  - b. Describe factors that indicate a good credit rating (e.g., returns, repayment capacity, risk).
  - c. Discuss guidelines for wise use of credit.
  - d. Describe procedures for obtaining credit.
  - e. Explain how credit is used in the decision-making process.
3. Compare loan options. <sup>DOK2</sup>
  - a. Discuss the different uses of loan funds (e.g., business and personal loans).
  - b. Describe procedures for obtaining agribusiness loans.
  - c. Identify the types of collateral that can be used to obtain a loan.
  - d. Calculate the cost of a loan.
  - e. Explain the process of filling out a loan application.
4. Describe basic record-keeping principles. <sup>DOK3</sup>
  - a. Discuss the purpose of keeping records.
  - b. Define terms associated with keeping financial records.
    - Accounting
    - Bookkeeping
    - Cash accounting
    - Accrual accounting
    - Whole-business records
    - Enterprise records
    - Income
    - Expenses
    - Inventory
    - Capital
    - Assets
    - Liabilities
    - Depreciation

<ul style="list-style-type: none"> <li>c. Compare types of accounting and bookkeeping systems used in agribusiness.</li> <li>d. Differentiate between accounting and bookkeeping.</li> <li>e. Explain why financial records are necessary.</li> <li>f. Describe the accounting cycle (i.e., calendar and fiscal year).</li> <li>g. Differentiate between bookkeeping and journals.</li> <li>h. Differentiate between the cash and accrual accounting systems.</li> <li>i. Differentiate between whole-business records and enterprise records.</li> </ul>
<p>5. Apply basic inventory principles. <sup>DOK2</sup></p> <ul style="list-style-type: none"> <li>a. Describe the uses of an inventory.</li> <li>b. Distinguish between liquid assets, consumable supplies, capital, and noncapital assets.</li> <li>c. Determine when to inventory (calendar or fiscal year).</li> <li>d. Determine the inventory values of non-depreciable and depreciable assets.</li> <li>e. Explain depreciation on capital goods.</li> <li>f. Define terms associated with depreciation. <ul style="list-style-type: none"> <li>• Write-off</li> <li>• Capital goods</li> <li>• Salvage value</li> <li>• Useful life</li> </ul> </li> <li>g. Compare methods of depreciation (i.e., straight line vs. accelerated).</li> <li>h. Calculate inventory values of depreciable assets using the straight-line depreciation method.</li> </ul>
<p>6. Examine a balance sheet (i.e., net worth statement). <sup>DOK2</sup></p> <ul style="list-style-type: none"> <li>a. Differentiate between current and noncurrent assets and liabilities.</li> <li>b. Use a balance sheet to calculate the net worth of a business.</li> <li>c. Analyze a statement of owner equity for an agribusiness.</li> <li>d. Associate the concepts of liquidity, solvency, and equity and their relationship to assets, liabilities, and net worth.</li> <li>e. Evaluate the financial standing of a given agribusiness using various financial-analysis ratios. <ul style="list-style-type: none"> <li>• Solvency (debt-asset ratio)</li> <li>• Liquidity (current ratio)</li> <li>• Profitability (return on assets ratio)</li> <li>• Repayment capacity</li> <li>• Financial efficiency (asset turnover ratio)</li> </ul> </li> </ul>
<p>7. Examine an income statement. <sup>DOK2</sup></p> <ul style="list-style-type: none"> <li>a. Differentiate between operating expenses, operating income, and revenue.</li> <li>b. Summarize income and expenses.</li> <li>c. Use an income statement to calculate profit or loss.</li> <li>d. Determine gross revenue.</li> </ul>

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|--|
| 8. Manage personal income taxes. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Prepare a W-4 to authorize withholding of income taxes from a paycheck.</li><li>Calculate take-home pay for a given period.</li><li>Complete a federal and state itemized and non-itemized tax form (e.g., 1040).</li></ol> |
| 9. Manage business taxes. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Identify types of business taxes (e.g., sales taxes, property taxes, licenses and permits, income taxes, etc.).</li><li>Describe forms used to report and pay business taxes (e.g., Schedule F, Schedule C, etc.).</li></ol>       |

# Student Competency Profile

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**Student's Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Leadership and SAE for All</b>		
	1.	Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration.
	2.	Identify potential college and career opportunities in animal agriculture.
	3.	Review the types of programs under SAE for All.
	4.	Review individual plans for student Foundational SAE programs.
	5.	Develop an Immersion SAE and maintain agricultural records.
<b>Unit 2: Introduction to Animal Agriculture</b>		
	1.	Investigate the nature of animal agriculture and its associated enterprises.
	2.	Discuss the beef cattle industry.
	3.	Discuss the dairy cattle industry.
	4.	Discuss the equine industry.
	5.	Discuss the swine industry.
	6.	Discuss the poultry industry.
	7.	Discuss the aquaculture industry.
	8.	Discuss the goat industry.
	9.	Discuss the sheep industry.
	10.	Conduct an in-depth investigation of an animal industry in your area that provides opportunities for hands-on experience while developing workplace skills.
<b>Unit 3: Worker Safety, Biosecurity, and Emergency Management</b>		
	1.	Investigate workplace safety and the use of personal protective equipment (PPE).
	2.	Develop and maintain an emergency action plan (EAP) for working in animal agriculture.
	3.	Evaluate biosecurity risks in animal agriculture and understand how to mitigate risk.



<b>Unit 4: Application of Feed and Feeding to Animal Growth and Production</b>		
	1.	Investigate the role of the animal digestive system in growth and nutrition.
	2.	Examine the role of nutrition in animal growth and health at different life stages.
	3.	Explain the role of nutrition in agricultural animal production.
	4.	Explain how animals are fed.
	5.	Describe the various types of feeding systems used in livestock production, (e.g., hand-fed, free choice/ad libidum, creep feed).
	6.	Discuss forage management systems that emphasize production and utilization by ruminants and pseudoruminants.
<b>Unit 5: Genetics</b>		
	1.	Discuss the application of heredity and genetics in animal production.
	2.	Predict the transmission of a trait from parents to offspring using a Punnett square to complete a monohybrid and dihybrid cross.
<b>Unit 6: Animal Reproduction</b>		
	1.	Examine the process of reproduction in animal production.
	2.	Examine the reproduction process.
	3.	Investigate the use of breeding systems and genetic improvement techniques.
	4.	Determine which breeding system works best for specific animal enterprises.
	5.	Discuss new scientific technology that will be of benefit to livestock producers.
<b>Unit 7: Livestock Evaluation and Selection</b>		
	1.	Evaluate the external parts of an agricultural animal as they relate to selecting quality animals for meat production or breeding purposes.
	2.	Investigate the selection of market animals.
	3.	Describe the process of selecting breeding animals.
	4.	Evaluate market livestock.
	5.	Evaluate performance livestock.
	6.	Evaluate breeding livestock.
<b>Unit 8: Animal Production Management</b>		
	1.	Examine basic concepts of animal health, including disease prevention, control, and treatment.
	2.	Investigate how factors such as age, genetic background, stocking density, and natural immunity affect animal health and resistance to diseases.
	3.	Observe and describe management and marketing practices for various animal enterprises.

<b>Unit 9: Facility and Equipment Management in Animal Agriculture</b>		
	1.	Explore facility, equipment, sales, and management needs for various animal enterprises.
	2.	Develop a production management plan, including facilities, equipment, production records, and maintaining and protecting animal health for a herd or flock.
	3.	Explore concepts of animal transportation.
<b>Unit 10: Issues in Animal Agriculture</b>		
	1.	Explore concepts of animal welfare and animal rights.
	2.	Examine consumer concerns and their effect on animal production.
	3.	Compare bioterrorism to biosecurity and discuss the effect each have on animal agriculture.
	4.	Analyze public perceptions of animal production for human food consumption and complete a project on the findings.
<b>Unit 11: Business Management in Animal Agriculture</b>		
	1.	Explore banking services for personal and business accounts.
	2.	Explore concepts of credit.
	3.	Compare loan options.
	4.	Describe basic record-keeping principles.
	5.	Apply basic inventory principles.
	6.	Examine a balance sheet (i.e., net worth statement).
	7.	Examine an income statement.
	8.	Manage personal income taxes.
	9.	Manage business taxes.

## Appendix A: Industry Standards

### Framework for AFNR Content Standards and Performance Elements Crosswalk for Diversified Agriculture Animals Core

	Unit	1	2	3	4	5	6	7	8	9	10	11
AFNR												
ABS- Agribusiness Systems		X	X	X					X	X		X
AS- Animal Systems		X	X	X	X	X	X	X	X	X	X	X
BS- Biotechnology						X	X			X		
CRP- Career Ready Practices		X	X	X	X	X	X	X	X	X	X	X
CS- AFNR Cluster Skill		X	X	X	X	X	X	X	X	X	X	X
ES- Environmental Service Systems											X	
FPP- Food Products and Processing Systems			X		X			X			X	
NRS- Natural Resource Systems											X	
PS- Plant Systems												
PST- Power, Structural, and Technical Systems												

### AFNR Pathway Content Standards and Performance Elements

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**ABS AGRIBUSINESS SYSTEMS**  
**AS ANIMAL SYSTEMS**  
**BS BIOTECHNOLOGY**  
**CRP CAREER READY PRACTICES**  
**CS AGRICULTURE FOOD AND NATURAL RESOURCES CLUSTER SKILL**  
**ES ENVIRONMENTAL SERVICE SYSTEMS**  
**FPP FOOD PRODUCTS AND PROCESSING SYSTEMS**  
**NRS NATURAL RESOURCE SYSTEMS**  
**PS PLANT SYSTEMS**  
**PST POWER, STRUCTURAL, AND TECHNICAL SYSTEMS**

## Agribusiness Systems Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), and business planning, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agribusiness Systems (AG-ABS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ABS.01. CCTC Standard:** Apply management planning principles in AFNR businesses.

**ABS.01.01. Performance Indicator:** Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.

**ABS.01.02. Performance Indicator:** Read, interpret, evaluate and write statements of purpose to guide business goals, objectives and resource allocation.

**ABS.01.03. Performance Indicator:** Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.

**ABS.01.04. Performance Indicator:** Evaluate, develop and implement procedures used to recruit, train and retain productive human resources for AFNR businesses.

**ABS.02. CCTC Standard:** Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

**ABS.02.01. Performance Indicator:** Apply fundamental accounting principles, systems, tools and applicable laws and regulations to record, track and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

**ABS.02.02. Performance Indicator:** Assemble, interpret and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash-flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

**ABS.03. CCTC Standard:** Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

**ABS.03.01. Performance Indicator:** Develop, assess and manage cash budgets to achieve AFNR business goals.

**ABS.03.02. Performance Indicator:** Analyze credit needs and manage credit budgets to achieve AFNR business goals.

**ABS.04. CCTC Standard:** Develop a business plan for an AFNR business.

**ABS.04.01. Performance Indicator:** Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

**ABS.04.02. Performance Indicator:** Develop production and operational plans for an AFNR business.

**ABS.04.03. Performance Indicator:** Identify and apply strategies to manage or mitigate risk.

**ABS.05. CCTC Standard:** Use sales and marketing principles to accomplish AFNR business objectives.

**ABS.05.01. Performance Indicator:** Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.

**ABS.05.02. Performance Indicator:** Assess and apply sales principles and skills to accomplish AFNR business objectives.

**ABS.05.03. Performance Indicator:** Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

## Animal Systems Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, and management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Animal Systems (AG-AS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**AS.01. CCTC Standard:** Analyze historic and current trends impacting the animal systems industry.

**AS.01.01. Performance Indicator:** Evaluate the development and implications of animal origin, domestication and distribution on production practices and the environment.

**AS.01.02. Performance Indicator:** Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.

- AS.01.03. Performance Indicator:** Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.
- AS.02. CCTC Standard:** Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.
- AS.02.01. Performance Indicator:** Demonstrate management techniques that ensure animal welfare.
- AS.02.02. Performance Indicator:** Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).
- AS.03. CCTC Standard:** Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.
- AS.03.01. Performance Indicator:** Analyze the nutritional needs of animals.
- AS.03.02 Performance Indicator:** Analyze feed rations and assess if they meet the nutritional needs of animals.
- AS.03.03 Performance Indicator:** Utilize industry tools to make animal nutrition decisions.
- AS.04. CCTC Standard:** Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.
- AS.04.01. Performance Indicator:** Evaluate animals for breeding readiness and soundness.
- AS.04.02. Performance Indicator:** Apply scientific principles to select and care for breeding animals.
- AS.04.03 Performance Indicator:** Apply scientific principles to breed animals.
- AS.05. CCTC Standard:** Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.
- AS.05.01. Performance Indicator:** Design animal housing, equipment and handling facilities for the major systems of animal production.
- AS.05.02. Performance Indicator:** Comply with government regulations and safety standards for facilities used in animal production.
- AS.06. CCTC Standard:** Classify, evaluate and select animals based on anatomical and physiological characteristics.
- AS.06.01. Performance Indicator:** Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).
- AS.06.02. Performance Indicator:** Apply principles of comparative anatomy and physiology to uses within various animal systems.
- AS.06.03. Performance Indicator:** Select and train animals for specific purposes and maximum performance based on anatomy and physiology.
- AS.07. CCTC Standard:** Apply principles of effective animal health care.
- AS.07.01. Performance Indicator:** Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

**AS.07.02. Performance Indicator:** Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

**AS.08. CCTC Standard:** Analyze environmental factors associated with animal production.

**AS.08.01. Performance Indicator:** Design and implement methods to reduce the effects of animal production on the environment.

**AS.08.02. Performance Indicator:** Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

## Common Career Technical Core Career Ready Practices Content Standards

The CCTC CRPs encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical-thinking, problem solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

**DEFINITIONS:** Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for CRPs from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a CTE program of study.

**CRP.01. CCTC Standard:** Act as a responsible and contributing citizen and employee.

**CRP.01.01. Performance Indicator:** Model personal responsibility in the workplace and community.

**CRP.01.02 Performance Indicator:** Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.

**CRP.01.03. Performance Indicator:** Identify and act upon opportunities for professional and civic service at work and in the community.

**CRP.02. CCTC Standard:** Apply appropriate academic and technical skills.

**CRP.02.01. Performance Indicator:** Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

**CRP.02.02. Performance Indicator:** Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

**CRP.03. CCTC Standard:** Attend to personal health and financial well-being.

**CRP.03.01. Performance Indicator:** Design and implement a personal wellness plan.

**CRP.03.02. Performance Indicator:** Design and implement a personal financial management plan.

**CRP.04. CCTC Standard:** Communicate clearly, effectively and with reason.

**CRP.04.01. Performance Indicator:** Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

**CRP.04.02. Performance Indicator:** Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

**CRP.04.03. Performance Indicator:** Model active listening strategies when interacting with others in formal and informal settings.

**CRP.05. CCTC Standard:** Consider the environmental, social and economic impacts of decisions.

**CRP.05.01. Performance Indicator:** Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.

**CRP.05.02. Performance Indicator:** Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

**CRP.06. CCTC Standard:** Demonstrate creativity and innovation.

**CRP.06.01. Performance Indicator:** Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

**CRP.06.02. Performance Indicator:** Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

**CRP.06.03. Performance Indicator:** Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

**CRP.07. CCTC Standard:** Employ valid and reliable research strategies.

**CRP.07.01. Performance Indicator:** Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

**CRP.07.02. Performance Indicator:** Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

**CRP.08. CCTC Standard:** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP.08.01. Performance Indicator:** Apply reason and logic to evaluate workplace and community situations from multiple perspectives.



**CRP.08.02. Performance Indicator:** Investigate, prioritize and select solutions to solve problems in the workplace and community.

**CRP.08.03. Performance Indicator:** Establish plans to solve workplace and community problems and execute them with resiliency.

**CRP.09. CCTC Standard:** Model integrity, ethical leadership and effective management.

**CRP.09.01. Performance Indicator:** Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

**CRP.09.02. Performance Indicator:** Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

**CRP.09.03. Performance Indicator:** Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

**CRP.10. CCTC Standard:** Plan education and career path aligned to personal goals.

**CRP.10.01. Performance Indicator:** Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

**CRP.10.02. Performance Indicator:** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

**CRP.10.03. Performance Indicator:** Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

**CRP.10.04. Performance Indicator:** Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

**CRP.11. CCTC Standard:** Use technology to enhance productivity.

**CRP.11.01. Performance Indicator:** Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

**CRP.11.02. Performance Indicator:** Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.

**CRP.12. CCTC Standard:** Work productively in teams while using cultural/global competence.

**CRP.12.01. Performance Indicator:** Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

**CRP.12.02. Performance Indicator:** Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

## **Agriculture, Food, and Natural Resources Cluster Skill Content Standards**

The AFNR Cluster Skills (CS) encompasses the study of fundamental knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career

pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agriculture, Food and Natural Resources Career Cluster® (AG) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**CS.01. CCTC Standard:** Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

**CS.01.01. Performance Indicator:** Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

**CS.01.02. Performance Indicator:** Examine technologies and analyze their impact on AFNR systems.

**CS.01.03. Performance Indicator:** Identify public policies and examine their impact on AFNR systems.

**CS.02. CCTC Standard:** Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

**CS.02.01. Performance Indicator:** Research and use geographic and economic data to solve problems in AFNR systems.

**CS.02.02. Performance Indicator:** Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

**CS.03. CCTC Standard:** Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

**CS.03.01. Performance Indicator:** Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.

**CS.03.02. Performance Indicator:** Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

**CS.03.03. Performance Indicator:** Apply health and safety practices to AFNR workplaces.

**CS.03.04. Performance Indicator:** Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

**CS.04. CCTC Standard:** Demonstrate stewardship of natural resources in AFNR activities.

**CS.04.01. Performance Indicator:** Identify and implement practices to steward natural resources in different AFNR systems.

**CS.04.02. Performance Indicator:** Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.

**CS.05. CCTC Standard:** Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

**CS.05.01. Performance Indicator:** Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).

**CS.06. CCTC Standard:** Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

**CS.06.01. Performance Indicator:** Examine and explain foundational cycles and systems of AFNR.

**CS.06.02. Performance Indicator:** Analyze and explain the connection and relationships between different AFNR systems on a national and global level.

## **Biotechnology Systems Career Pathway Content Standards**

The Biotechnology Systems (BS) Career Pathway encompasses the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- **National Council for Agricultural Education (NCAE) Standard\*** – These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying biotechnology to AFNR systems.
- **Performance Indicators** – These statements distill each performance element into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related performance element at the conclusion of a program of study in this area.

**BS.01. NCAE Standard:** Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).

**BS.01.01. Performance Indicator:** Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).

**BS.01.02. Performance Indicator:** Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).

**BS.01.03. Performance Indicator:** Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

**BS.02. NCAE Standard:** Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

**BS.02.01. Performance Indicator:** Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.

**BS.02.02. Performance Indicator:** Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.

**BS.02.03. Performance Indicator:** Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

**BS.02.04. Performance Indicator:** Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

**BS.02.05. Performance Indicator:** Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

**BS.03. NCAE Standard:** Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

**BS.03.01. Performance Indicator:** Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

**BS.03.02. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

**BS.03.03. Performance Indicator:** Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

**BS.03.04. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

**BS.03.05. Performance Indicator:** Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).

**BS.03.06. Performance Indicator:** Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

## Environmental Service Systems Career Pathway Content Standards

The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Environmental Service Systems (AG-ESS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ESS.01. CCTC Standard:** Use analytical procedures and instruments to manage environmental service systems.

**ESS.01.01. Performance Indicator:** Analyze and interpret laboratory and field samples in environmental service systems.

**ESS.01.02. Performance Indicator:** Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

**ESS.02. CCTC Standard:** Evaluate the impact of public policies and regulations on environmental service system operations.

**ESS.02.01. Performance Indicator:** Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.

**ESS.02.02. Performance Indicator:** Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).

**ESS.02.03. Performance Indicator:** Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

**ESS.03. CCTC Standard:** Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

**ESS.03.01. Performance Indicator:** Apply meteorology principles to environmental service systems.

**ESS.03.02. Performance Indicator:** Apply soil science and hydrology principles to environmental service systems.

**ESS.03.03. Performance Indicator:** Apply chemistry principles to environmental service systems.

**ESS.03.04. Performance Indicator:** Apply microbiology principles to environmental service systems.

**ESS.03.05. Performance Indicator:** Apply ecology principles to environmental service systems.

**ESS.04. CCTC Standard:** Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

**ESS.04.01. Performance Indicator:** Use pollution control measures to maintain a safe facility and environment.

**ESS.04.02. Performance Indicator:** Manage safe disposal of all categories of solid waste in environmental service systems.

**ESS.04.03. Performance Indicator:** Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

**ESS.04.04. Performance Indicator:** Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.

**ESS.05. CCTC Standard:** Use tools, equipment, machinery and technology common to tasks in environmental service systems.

**ESS.05.01. Performance Indicator:** Use technological and mathematical tools to map land, facilities and infrastructure for environmental service systems.

**ESS.05.02. Performance Indicator:** Perform assessments of environmental conditions using equipment, machinery and technology.

## **Food Products and Processing Systems Career Pathway Content Standards**

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety and sanitation; nutrition, biology, microbiology, chemistry and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Food Products and Processing Systems (AG-FPP) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to

demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**FPP.01. CCTC Standard:** Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

**FPP.01.01. Performance Indicator:** Analyze and manage operational and safety procedures in food products and processing facilities.

**FPP.01.02. Performance Indicator:** Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

**FPP.01.03. Performance Indicator:** Apply food safety procedures when storing food products to ensure food quality.

**FPP.02. CCTC Standard:** Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

**FPP.02.01. Performance Indicator:** Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.02. Performance Indicator:** Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.03. Performance Indicator:** Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.03. CCTC Standard:** Select and process food products for storage, distribution and consumption.

**FPP.03.01. Performance Indicator:** Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

**FPP.03.02. Performance Indicator:** Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

**FPP.03.03. Performance Indicator:** Create food distribution plans and procedures to ensure safe delivery of food products.

**FPP.04. CCTC Standard:** Explain the scope of the food industry and the historical and current developments of food product and processing.

**FPP.04.01. Performance Indicator:** Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

**FPP.04.02. Performance Indicator:** Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

**FPP.04.03. Performance Indicator:** Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

## Natural Resource Systems Career Pathway Content Standards

The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of natural resource systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Natural Resource Systems (AG-NRS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**NRS.01. CCTC Standard:** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

**NRS.01.01. Performance Indicator:** Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.

**NRS.01.02. Performance Indicator:** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.

**NRS.01.03. Performance Indicator:** Apply ecological concepts and principles to atmospheric natural resource systems.

**NRS.01.04. Performance Indicator:** Apply ecological concepts and principles to aquatic natural resource systems.

**NRS.01.05. Performance Indicator:** Apply ecological concepts and principles to terrestrial natural resource systems.

**NRS.01.06. Performance Indicator:** Apply ecological concepts and principles to living organisms in natural resource systems.

**NRS.02. CCTC Standard:** Analyze the interrelationships between natural resources and humans.

**NRS.02.01. Performance Indicator:** Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).

**NRS.02.02. Performance Indicator:** Assess the impact of human activities on the availability of natural resources.

**NRS.02.03. Performance Indicator:** Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.



**NRS.02.04. Performance Indicator:** Examine and explain how economics affects the use of natural resources.

**NRS.02.05. Performance Indicator:** Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

**NRS.03. CCTC Standard:** Develop plans to ensure sustainable production and processing of natural resources.

**NRS.03.01. Performance Indicator:** Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

**NRS.03.02. Performance Indicator:** Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

**NRS.04. CCTC Standard:** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

**NRS.04.01. Performance Indicator:** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

**NRS.04.02. Performance Indicator:** Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

**NRS.04.03. Performance Indicator:** Prevent or manage introduction of ecologically harmful species in a particular region.

**NRS.04.04. Performance Indicator:** Manage fires in natural resource systems.

## Plant Science Systems Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Plant Systems (AG-PS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

- PS.01. CCTC Standard:** Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- PS.01.01. Performance Indicator:** Determine the influence of environmental factors on plant growth.
- PS.01.02. Performance Indicator:** Prepare and manage growing media for use in plant systems.
- PS.01.03. Performance Indicator:** Develop and implement a fertilization plan for specific plants or crops.
- PS.02. CCTC Standard:** Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.01. Performance Indicator:** Classify plants according to taxonomic systems.
- PS.02.02. Performance Indicator:** Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Performance Indicator:** Apply knowledge of plant physiology and energy conversion to plant systems.
- PS.03. CCTC Standard:** Propagate, culture and harvest plants and plant products based on current industry standards.
- PS.03.01. Performance Indicator:** Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Performance Indicator:** Develop and implement a management plan for plant production.
- PS.03.03. Performance Indicator:** Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Performance Indicator:** Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Performance Indicator:** Harvest, handle and store crops according to current industry standards.
- PS.04. CCTC Standard:** Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- PS.04.01. Performance Indicator:** Evaluating, identifying and preparing plants to enhance an environment.
- PS.04.02. Performance Indicator:** Create designs using plants.

## Power, Structural and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Power, Structural and Technical Systems (AG-PST) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**PST.01. CCTC Standard:** Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

**PST.01.01. Performance Indicator:** Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.

**PST.01.02. Performance Indicator:** Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.

**PST.01.03. Performance Indicator:** Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).

**PST.02. CCTC Standard:** Operate and maintain AFNR mechanical equipment and power systems.

**PST.02.01. Performance Indicator:** Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.

**PST.02.02. Performance Indicator:** Operate machinery and equipment while observing all safety precautions in AFNR settings.

**PST.03. CCTC Standard:** Service and repair AFNR mechanical equipment and power systems.

**PST.03.01. Performance Indicator:** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.

**PST.03.02. Performance Indicator:** Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.

**PST.03.03. Performance Indicator:** Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

**PST.04. CCTC Standard:** Plan, build and maintain AFNR structures.

**PST.04.01. Performance Indicator:** Create sketches and plans for AFNR structures.

**PST.04.02. Performance Indicator:** Determine structural requirements, specifications and estimate costs for AFNR structures

**PST.04.03. Performance Indicator:** Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).

**PST.04.04. Performance Indicator:** Apply electrical wiring principles in AFNR structures.

**PST.05. CCTC Standard:** Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.

**PST.05.01. Performance Indicator:** Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

**PST.05.02. Performance Indicator:** Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.

**PST.05.03. Performance Indicator:** Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.

## Appendix B: Beef Quality Assurance

Framework for AFNR Content Standards and Performance Elements Crosswalk for the Beef Quality Assurance (BQA) national certification

Beef Quality Assurance (BQA)	Unit	1	2	3	4	5	6	7	8	9	10	11
Standard												
Chapter 1: BQA		X	X	X	X	X	X	X	X	X	X	X
Chapter 2: Cattle Care		X	X	X				X	X	X		
Chapter 3: Biosecurity				X					X		X	
Chapter 4: Herd Health				X	X	X	X		X	X		
Chapter 5: Transporting									X	X	X	
Chapter 6: Record Keeping		X	X	X					X			X
Chapter 7: Nutrition				X	X				X		X	
Chapter 8: Environmental Stewardship				X					X	X		
Chapter 9: Worker Safety		X	X	X							X	
Chapter 10: Emergency Action Planning				X								

### Beef Quality Assurance Content Standards and Performance Elements

Beef Quality Assurance is a nationally coordinated, state implemented program that provides systematic information to U.S. beef producers and beef consumers of how common-sense husbandry techniques can be coupled with accepted scientific knowledge to raise cattle under optimum management and environmental conditions. BQA guidelines are designed to make certain all beef consumers can take pride in what they purchase – and can trust and have confidence in the entire beef industry.

#### Industry Value

BQA does more than just help beef producers capture more value from their market cattle: BQA also reflects a positive public image and instills consumer confidence in the beef industry. When producers implement the best management practices of a BQA program, they assure their market steers, heifers, cows, and bulls are the best they can be. Today, the stakes are even higher because of increased public attention on animal welfare. BQA is valuable to all beef and dairy producers because it:

- Demonstrates commitment to food safety and quality.
- Safeguards the public image of the dairy industry.
- Upholds consumer confidence in valuable beef products.
- Improves sale value of marketed beef cattle.
- Enhances herd profitability through better management.

## **Chapter 1: BQA**

### **1.1 Welcome and Principles of BQA**

### **1.2 Background of BQA**

#### **1.2.1 Rationale for BQA**

#### **1.2.2 Brief History of BQA**

### **1.3 Goals and Objectives of BQA**

### **1.4 Program Guidelines and Overview**

#### **1.4.1 Use of Key Practices**

#### **1.4.2 Training via State Coordinators or BQA Online**

### **1.5 Certification and Recertification Requirements**

#### **1.5.1 Relationship to Farm and VQA Programs**

### **1.6 Beef Quality Audit Overview**

### **1.7 Foundational Models of the BQA Approach**

#### **1.7.1 Total Quality Management**

#### **1.7.2 HACCP-like Considerations**

### **1.8 Key Practices**

- Provide personnel with training/experience to properly handle and care for cattle. (Code of Cattle Care)
- Make timely observations of cattle to ensure basic needs are being met.
- Provide facilities that allow safe, humane, and efficient movement and/or restraint of cattle. (Code of Cattle Care)
- Use appropriate methods to humanely euthanize terminally sick or injured livestock and properly handle carcasses. (Code of Cattle Care)

## **Chapter 2: Behavior and Handling**

### **2.1 Introduction**

### **2.2 Key Practices**

- Abuse of cattle is not acceptable under any circumstances.
- Provide personnel with training/experience to properly handle and care for cattle.
- Make timely observations of cattle to ensure basic needs are being met.
- Design, provide, and regularly inspect facilities (fences, corrals, load-outs, stations, free stall areas, alleys, etc.) to help ensure safe and easy animal movement and restraint.
- Keep feed and water handling equipment clean.

### **2.3 Cattle Behavior-Informed Handling**

### **2.4 Cattle Handling Facilities and Equipment**

## **Chapter 3: Biosecurity**

### **3.1 Introduction**

### 3.2 Key Practices

- Evaluate the biosecurity risks on your operation and follow a plan to help mitigate risk.
- Recognize and mitigate the biosecurity risks associated with the introduction of new cattle and inter-herd/-operation traffic.
- Apply basic sanitation practices to equipment, vehicles, and clothing to decrease the chance of microbial contamination.
- Prevent manure contamination of feed and feeding equipment.

### 3.3 Spread of Diseases

### 3.4 Biosecurity Practices

## Chapter 4: Herd Health Management

### 4.1 Introduction

### 4.2 Key Practices

- Develop a herd health plan that conforms to good veterinary and husbandry practices.
- Provide disease prevention practices to protect herd health including access to veterinary medical care.
- Follow all FDA/USDA/EPA guidelines and label directions for each product.
- Use FDA-approved feed additives, including those requiring veterinary feed directives (VFD), in accordance of the FDA use requirements. The FDA requires all VFD records to be retained for two (2) years and available upon FDA request for inspection.
- Keep extra-label drug use (ELDU) to a minimum and only when prescribed by a veterinarian working within a Veterinary/Client/Patient Relationship (VCPR).
- Administer products labeled for subcutaneous (SQ) administration in the neck region ahead of the shoulder slope.
- Use, when available, products cleared for SQ, Intravenous (IV), Intranasal (IN), or oral administration when available rather than products administered Intramuscular (IM) as all products can cause tissue damage when administered IM.
- Always ensure products labeled for IV-only are never given by any other route of administration because of the potential for causing violative residues at the injection site.
- Use, when available, injectable products with low dosage volumes and following the proper spacing of injections.
- Administer products labeled for intramuscular (IM) in the neck region only — no exceptions, regardless of age.
- Do no administer more than 10cc of product per IM injection site.
- Use the proper needle size for injections and never reuse a bent needle.
- Do not market compromised — terminally ill and/or non-ambulatory cattle.
- Humanely euthanize non-ambulatory animals using appropriate methods

### 4.3 Herd Health Planning

### 4.4 Vaccinations and Disease Prevention

### 4.5 Judicious Use of Antimicrobials

### 4.6 A Beef Producer's Guide for Judicious Use of Antibiotics in Cattle

### 4.7 Product Handling and Storage

## 4.8 Processing & Injections

- 4.8.1 Receiving, acclimation, and processing cattle
- 4.8.2 Cattle identification, castration, and dehorning
- 4.8.3 Syringe and needle guidelines
- 4.8.4 Injection sites
- 4.8.5 Pain management

## 4.9 Feed Additives and Medicated Feeds

### 4.10 Disease Management

- 4.10.1 Extra-label drug use (ELDU)
- 4.10.2 Compounding

### 4.11 Euthanasia

## Chapter 5: Transportation

### 5.1 Introduction

### 5.2 Key Practices

- It is not acceptable to knowingly inflict physical injury or unnecessary pain on cattle when loading, unloading, or transporting animals is not acceptable.
- Handle/transport all cattle in a manner to minimize stress, injury, and bruising.
- Use vehicles to transport cattle that provide for the safety of personnel and cattle during loading, transporting, and unloading.
- Follow guidelines when transporting your own livestock:
  - Do a structural check of trailer/truck and tires prior to loading livestock.
  - Inspect trailer/truck for cleanliness (biosecurity) as well as condition of flooring and broken gates that may injure/bruise cattle.
  - Check weather and route to ensure for a safe and uneventful trip.
  - Verify drug withdrawal times on any animals being sold.
  - Verify that all animals are fit to ship.
  - Back up squarely and evenly to the loading chute.
  - Load using Low Stress Handling Practices.
  - Pull away from the chute slowly and drive smoothly to allow cattle a chance to gain their balance in-transit.
  - Minimize time in-transit by limiting stops and using prior-preparation to ensure an organized event.
- Follow guidelines when contracting for your livestock to be hauled:
  - Establish good communication/logistics with both the trucking company and the receiver of the livestock.
  - Request that the truck arrive clean for loading to decrease biosecurity risks.
  - Check weather and route to ensure for a safe and uneventful trip.
  - Verify drug withdrawal times on any animals being sold.
  - Verify that all animals are fit to ship.
  - Ensure that the driver backs up squarely and evenly to the loading chute.
  - Load using Low Stress Handling Practices.



- Ensure that the driver pulls away from the chute slowly and drives smoothly to allow cattle a chance to gain their balance in-transit.
- Encourage the driver to minimize time in-transit by limiting stops and using prior-preparation to ensure an organized event.
- Ask hauling contractor/driver for proof of BQA Transportation Certification.

### **5.3 Loading and Unloading**

### **5.4 Fitness for Transport**

#### **5.4.1 Cull cattle**

#### **5.4.2 Marketing guidelines**

### **5.5 Travel Considerations/Factors**

## **Chapter 6: Record Keeping**

### **6.1 Introduction**

### **6.2 Key Practices**

- Employ strict adherence to withdrawal periods on product labels and to extended withdrawals as determined by a veterinarian within the context of a VCPR.
- Identify all animals with appropriate individual and/or group identification methods.
- When cattle are treated/processed individually, record the following in the treatment records:
  - Individual animal identification
  - Date treated
  - Product administered and manufacturer's lot/serial number
  - Dosage
  - Route and location of administration
  - Earliest date animal will have cleared the withdrawal period
  - Name of individual administering the treatment
- When cattle are treated/processed as a group, identify all cattle within the group as such and record the following information:
  - Group or lot identification
  - Date treated
  - Product administered and manufacturer's lot/serial number
  - Dosage
  - Route and location of administration
  - Earliest date animal will have cleared the withdrawal period
  - Name of individual administering the treatment
- Transfer all processing and treatment records with the cattle to next production level.
- Inform prospective buyers of any cattle that have not met withdrawal times.
- When applicable, keep complete records when formulating or feeding medicated feed rations.
- Maintain records of any pesticide use on pasture or crops that could potentially lead to violative residue in cattle.

- Keep records for a minimum of two (2) years, or longer as required by laws/regulations (e.g., three years for Restricted Use Pesticides).

### **6.3 Cattle Identification**

### **6.4 Types of Records**

### **6.5 Residue Avoidance**

## **Chapter 7: Nutrition**

### **7.1 Introduction**

### **7.2 Key Practices**

- Ensure cattle have access to an adequate water supply and appropriate nutrition (from Code of Cattle Care, modified for sentence structure).
- Avoid feed and water interruption longer than 24 hours.
- Only use feedstuffs and feed ingredients of satisfactory quality.
- Under certain circumstances (e.g., droughts, frosts, and floods), test feedstuffs or other dietary components to determine the presence of substances that can be detrimental to cattle well-being, such as nitrates, prussic acid, mycotoxins, etc.
- Use only USDA, FDA, and EPA approved products for use in cattle; these products must be used in accordance with the approved product use guidelines.
- Analyze suspect feedstuffs prior to use and seek supplier assurance of feed ingredient quality.
- Do not feed ruminant-derived protein sources per FDA regulations.
- Support feeding of by-product/co-product ingredients with sound science.

### **7.3 Cattle Nutrition**

**7.3.1** Feeding guidelines for cows, stocker cattle, and feeder cattle

**7.3.2** Weaning nutritional management

**7.3.3** BSE: ruminant protein ban

### **7.4 Feed Additives (Non-medicated)**

### **7.5 Feed Safety**

**7.5.1** Feed contaminants guidelines

**7.5.2** FSMA

## **Chapter 8: Environmental Quality Control Points**

### **8.1 Introduction**

### **8.2 Key Practices**

- Manage forage resources with appropriate principles to optimize production while protecting or enhancing the environment.
- Use, store, and dispose of all pesticides with care and according to label directions.
- Monitor and manage key environmental control points that affect soil and water resources.
- Properly dispose of carcasses.

### **8.3 Forages and Grazing**

### **8.4 Pesticide Use**

## **8.5 Soil**

## **8.6 Water Quality**

## **8.7 Mortality Disposal**

### **Chapter 9: Worker Safety**

#### **9.1 Introduction**

#### **9.2 Key Practices**

- Maintain a safe workplace and use appropriate personal protective equipment when needed.
- Train employees and others working in your operation on safe practices when using equipment, handling cattle, handling animal health products, and around potentially hazardous areas.

#### **9.3 Safety in Beef Production Situations**

### **Chapter 10: Emergency Action Planning**

#### **10.1 Introduction**

#### **10.2 Key Practices**

- Develop and maintain an emergency action plan.
- Inform everyone involved in your operation what to do in case of an emergency.

#### **10.3 Emergency Action Plans**





## 2022 Diversified Agriculture Environment Core

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE the diversified agriculture environment core curriculum is aligned to the following standards:

## **National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards**

The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in Grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted by the National Council for Agricultural Education and used with permission.

[thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr)

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oe/college-and-career-readiness-standards](http://mdek12.org/oe/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

The diversified agriculture environment core curriculum is a one-Carnegie Unit course within the four-credit diversified agriculture pathway. All students must complete the principles of agriscience course before being allowed to enroll in the environment core course. Emphasis in this pathway is centered around the impact that environmental factors have on agricultural production, as well as the effect of agricultural production on natural resources. The course provides an opportunity for students to go in-depth regarding the science of the environment and how agriculturalists should keep natural resources use, conservation, preservation, and sustainability at the forefront of their practice.

## College, Career, and Certifications

No national industry-recognized certifications are known to exist at this time in the field of environmental and natural resources. Competencies and suggested performance indicators in this course have been correlated, however, to the AFNR Career Cluster Content Standards that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
3. Instructor approval and TABE reading score (eighth grade or higher)

**or**

1. TABE reading and math score (eighth grade or higher)
2. Instructor approval

**or**

1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Applied Academic Credit

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

### **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

### **Professional Learning**

If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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This curriculum consists of one 1-credit course.

## **Diversified Agriculture Environment Core—Course Code: 991002**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Leadership and SAE for All	10
2	Application of Ecology to the Environment	25
3	The Effects of Weather and Climate	15
4	Soil, Land, and Mapping	25
5	Water Quality Management	25
6	Forest Management	20
7	Wildlife Management	20
<b>Total</b>		<b>140</b>

# Career Pathway Outlook

---

## Overview

The agricultural sciences career cluster covers the broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. According to the U.S. Department of Agriculture (USDA), through 2025, 59,400 jobs are expected to open in food, agriculture, renewable natural resources, or the environment for graduates with bachelor's or higher degrees in those areas. Almost half of those jobs will be in management and business at 42%; 31% in science, technology, engineering, and math (STEM) in agriculture; 13% in sustainable food and biomaterials production; and 14% in education, communication, and government services. According to the USDA, agriculture, food, and related industries contributed \$1.1 trillion to the U.S. gross domestic product (GDP) in 2019. The Mississippi Department of Agriculture and Commerce (MDAC) reports that agriculture is Mississippi's number one industry at \$7.4 billion and employing approximately 17.4% of the state's workforce.

Diversified agriculture will target careers at the professional and technical levels in agriculture. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college levels.

## Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (2016). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Yearly Earnings, 2020
Agricultural and Food Science Technicians	260	270	10	3.9%	\$39,270
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	\$93,260
Animal Trainers	100	110	10	10%	\$23,120
Career/Technical Education Teachers, Middle School	320	350	30	9.4%	\$47,270
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	\$50,370
Conservation Scientists	700	730	30	4.3%	\$54,950
Environmental Engineers	410	420	10	2.4%	\$75,940
Environmental Engineering Technicians	160	170	10	6.3%	\$46,790

Environmental Scientists and Specialists, Including Health	620	670	50	8.1%	\$64,460
Environmental Science and Protection Technicians, Including Health	420	460	40	9.5%	\$38,780
Farm and Home Management Advisors	290	300	10	3.2%	\$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	\$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	\$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	\$24,030
Soil and Plant Scientists	110	110	0	0%	\$92,250
Farmers, Ranchers, and Other Agricultural Managers	1,790	1,840	20	2.8%	\$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2%	\$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	\$54,550
Fish and Game Wardens	40	40	0	0%	\$46,610
Foresters	190	200	10	5.3%	\$52,660
Surveyors	450	470	20	4.4%	\$48,600
Surveying and Mapping Technicians	530	550	20	3.8%	\$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	\$44,920
Veterinarians	490	540	50	10.2%	\$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1,090	120	12.4%	\$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	\$35,890
Zoologists and Wildlife Biologists	260	270	10	3.9%	\$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).



### **Perkins V Requirements and Academic Infusion**

The diversified agriculture environment core curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for careers in agriculture. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

### **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## Best Practices

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The diversified agriculture educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the diversified agriculture curricula. FFA provides students with growth opportunities and competitive events and opens the doors to the world of agriculture and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The diversified agriculture curricula provide opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the curriculum that will allow and encourage collaboration with professionals currently in the agriscience field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the diversified agriculture classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and agriscience professionals. Thus, supervised collaboration and immersion into the agriculture industry around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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American Association for Agricultural Education (AAAE)

[aaaeonline.org](http://aaaeonline.org)

Association for Career and Technical Education (ACTE)

[acteonline.org](http://acteonline.org)

Mississippi ACTE

[mississippiacte.com](http://mississippiacte.com)

Mississippi FFA/ Mississippi Association of Vocational Agriculture Teachers (MAVAT)

[mississippiffa.org](http://mississippiffa.org)

National FFA Organization

[ffa.org](http://ffa.org)

National Association of Agricultural Educators (NAAE)

[naae.org](http://naae.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the environment core program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the environment core program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Leadership and SAE for All

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## Competencies and Suggested Objectives

1. Apply general safety precautions for the laboratory and field. <sup>DOK2</sup>
  - a. Demonstrate procedures for working in and maintaining a safe, orderly workplace.
  - b. Demonstrate personal safety and behavioral requirements for the laboratory and field.
  - c. Identify common hazards found in laboratory and field work and practice procedures to prevent injury.
  - d. Review information about hazardous materials on a safety data sheet (SDS).
2. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. <sup>DOK 3</sup>
  - a. Actively participate in FFA activities.
    - Leadership Development Events (LDE)
    - Career Development Events (CDE)
      - Environmental and Natural Resources
      - Forestry
      - Land Evaluation
    - Leadership retreats or conferences
    - Industry-related seminars, workshops, or conferences
    - Envirothon
    - Other related FFA activities
3. Identify potential college and career opportunities in environmental and natural resources. <sup>DOK 2</sup>
  - a. Research postsecondary institutions that offer studies in environmental and natural resources or a related field and prepare a two- to three-minute speech on their programs and potential career choices.
  - b. Complete applications for college admission and scholarships.
  - c. Revise a personal résumé for the purpose of applying for a specific job.
  - d. Complete a job application for employment.
  - e. Participate in a mock or real interview.
4. Review the types of programs under Supervised Agricultural Experience (SAE) for All. <sup>DOK 1</sup>
  - a. Explore concepts of a Foundational SAE.
    - Career exploration and planning
    - Employability skills for college and career readiness
    - Personal financial management and planning
    - Workplace safety
    - Agricultural literacy
  - b. Explore concepts of an Immersion SAE.
    - Placement/internship

<ul style="list-style-type: none"> <li>• Ownership/entrepreneurship</li> <li>• Research <ul style="list-style-type: none"> <li>○ Experimental</li> <li>○ Analytical</li> <li>○ Invention</li> </ul> </li> <li>• School-based enterprise</li> <li>• Service learning</li> </ul>
<p>5. Review individual plans for student Foundational SAE programs. <sup>DOK 2</sup></p> <ol style="list-style-type: none"> <li>a. Assess goal attainment in SAE from the previous year.</li> <li>b. Review and update short- and long-range goals pertaining to the SAE program.</li> </ol>
<p>6. Develop an Immersion SAE and maintain agricultural records. <sup>DOK 2</sup></p> <ol style="list-style-type: none"> <li>a. Redefine and adjust requirements of agreements between the student, parents, supervisor, and/or employer.</li> <li>b. Utilize an electronic/computer-based system of record keeping.</li> <li>c. Update SAE records. <ul style="list-style-type: none"> <li>• SAE program goals</li> <li>• Student inventory related to the SAE program</li> <li>• Expense records</li> <li>• Income/gift and scholarship records</li> <li>• Skill-attainment records</li> <li>• Leadership-activity records and participation in FFA activities</li> <li>• Community service hours</li> </ul> </li> <li>d. Complete degree and proficiency award applications as they apply to the SAE.</li> </ol>

## Unit 2: Application of Ecology to the Environment

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<b>Competencies and Suggested Objectives:</b>	
1. Identify ecological diversity in local agricultural and wildlife ecosystems. <sup>DOK2</sup>	
a. Distinguish between terrestrial and aquatic biomes and give examples of each.	
b. Explain the importance of environmental stability in the survival of organisms.	
c. Describe how an environmental community is organized and structured.	
2. Distinguish between terrestrial and aquatic biomes. <sup>DOK2</sup>	
a. Compare the characteristics of the various types of aquatic and terrestrial biomes.	
b. Classify the components of a habitat for wildlife organisms.	
c. Select a wildlife species to research and create a model habitat for that organism, including its place in a food web and other biotic and abiotic factors necessary for survival.	
3. Compare and contrast the impact of current trends on the regulation of environmental service systems, such as climate change, population growth, and international trade. <sup>DOK3</sup>	
4. Analyze issues that affect the global environment. <sup>DOK3</sup>	
a. Examine trends and factors influencing population changes.	
b. Investigate the demands of the human population on the environment and how these relate to agriculture.	
c. Investigate the causes and effects of landscape degradation and defacement on the environment.	
d. Evaluate the causes and effects of acid rain deposition on the environment.	
e. Evaluate the causes and effects of tropical rain forest destruction on the environment.	
f. Evaluate the causes and effects of greenhouse gases on the environment.	
g. Explain the role of forecasting in the environment.	
h. Design and implement a plan for improving and maintaining environmental quality in the local area.	

## Unit 3: The Effects of Weather and Climate

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<b>Competencies and Suggested Objectives</b>
1. Explain how the weather and climate affect the agricultural environment. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Distinguish the difference between climate and weather.</li><li>Discuss how the movement of the earth affects weather fronts, clouds, seasons, and storms.</li><li>Read and interpret weather measurements and maps.</li></ol>
2. Describe how weather elements are measured and recorded. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Measure atmospheric temperature.</li><li>Convert temperature measurements between Celsius and Fahrenheit.</li><li>Explain atmospheric pressure and how it is measured using a barometer.</li><li>Discuss how pressure systems and air masses affect wind speed.</li></ol>



## Unit 4: Soil, Land, and Mapping

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### Competencies and Suggested Objectives

1. Investigate the physical components of soil and how they affect soil use. <sup>DOK2</sup>
  - a. Explain how the soil structure and texture affects the availability of water in the soil.
  - b. Assess the color of soil using the Munsell system of color notation.
  - c. Use color labeling of soil to draw conclusions regarding the suitability of soil for various uses in agriculture and the environment.
  - d. Assess the highest productive land use by evaluating soil and land characteristics.
  - e. Determine the texture of a soil by using the feel test.
  - f. Determine the slope classification of a marked area of land.
  - g. Assess the structure of a soil in a soil profile and explain how the structure affects permeability.
  - h. Select a land capability class of a designated land area based upon its identified soil features and its highest productive use.
2. Demonstrate proficiency in land surveying, measurement, and mapping. <sup>DOK2</sup>
  - a. Identify common map symbols.
  - b. Explain how to interpret a legal land description.
  - c. Use a hand compass and pacing to determine the property lines of a marked area with compass readings (within 2 degrees) and distance (within 2 ft) properly recorded from point to point (use Azimuth readings).
  - d. Interpret a United States Geological Survey topographic map by recognizing topographic map symbols.
3. Explain proper soil management. <sup>DOK2</sup>
  - a. Identify soil degradation and how it occurs.
  - b. Explain the importance of soil conservation and relate conservation to best management practices.
  - c. Use identified soil features according to the land judging manual to recommend land treatments to assessed areas.
  - d. Describe how soil erosion impacts the water in streams, lakes, and oceans.
  - e. Identify tillage practices that promote and prevent soil erosion.
    - Conservation tillage
    - Contour farming
    - Terraces
  - f. Discuss the importance of protecting the soil from degradation.
  - g. Investigate the role of government agencies concerned with soil conservation.
    - Environmental Protection Agency (EPA)
    - Natural Resources Conservation Service (NRCS)
    - U.S. Army Corps of Engineers

# Unit 5: Water Quality Management

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<b>Competencies and Suggested Objectives</b>	
1. Explain the importance of managing water quality in the environment. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>Describe water quality and why it is important.</li><li>Explain the biological characteristics of water.</li><li>Discuss the sensitivity of organisms to water quality.</li><li>Explain the difference between surface water and ground water.</li></ol>
2. Describe the hydrologic cycle and how it is influenced by the environment. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Diagram and describe the water cycle.</li><li>Compare natural water bodies of flowing and nonflowing sources.<ul style="list-style-type: none"><li>Flowing (e.g., streams, rivers, creeks, brooks, canals)</li><li>Nonflowing (e.g., oceans, lakes, ponds, reservoirs, sloughs, marshes, estuaries)</li></ul></li><li>Assess the structure of a local stream or body of water and construct a food web diagram of an ecosystem that exists within the body of water.</li><li>Discuss the major functions and importance of watersheds.</li><li>Delineate a watershed on a topographic map.</li></ol>
3. Research and summarize methods used to determine water quality. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Discuss how pollution affects water quality.</li><li>Differentiate between point and nonpoint sources of pollution.</li><li>Identify common causes of water pollution and their sources.<ul style="list-style-type: none"><li>Sediment and suspended particles</li><li>Pathogens</li><li>Organic waste</li><li>Inorganic waste</li><li>Inorganic substances</li><li>Organic chemicals</li><li>Thermal pollution</li></ul></li><li>Explain how pond water quality and balance is influenced by the fish population.</li></ol>
4. Describe how water is managed and how wastewater is treated to maintain water quality. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Describe and analyze the qualities of potable water.<ul style="list-style-type: none"><li>Odor</li><li>Taste</li><li>Color</li><li>pH</li><li>Alkalinity</li><li>Hardness</li><li>Turbidity</li><li>Heavy metal content</li><li>Chemical and pesticide residue</li><li>Coliform bacterial count</li></ul></li><li>Identify and describe the types and sources of wastewater.<ul style="list-style-type: none"><li>Types of wastewater (i.e., spent, domestic, and sewage)</li></ul></li></ol>

- Sources of wastewater (e.g., homes and businesses, manufacturing, farms, storm water, storm sewers, etc.)
- c. Identify and describe hazards that may be present in water.
  - Infectious agents
  - Toxic wastes
  - Organic matter
  - Temperature
- d. Describe the treatment process in a municipal wastewater system.
  - Collection
  - Preliminary treatment
  - Primary treatment
  - Secondary treatment
  - Advanced treatment
  - Disposal of residue

# Unit 6: Forest Management

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<b>Competencies and Suggested Objectives</b>
<p>1. Describe the importance of forests and forest management to our environment and economy. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>Explain the importance of forestry to our nation.</li><li>Investigate the role of government agencies concerned with forestry, including the Mississippi Forestry Commission and the U.S. Forestry Service.</li><li>Describe the relationships between forests and other natural resources, such as the water cycle, wildlife habitats, and other areas of ecology.</li><li>Compare types of forest regions based upon their location and/or climate.</li><li>Describe the products we obtain from forests and the primary wood industries.</li></ol>
<p>2. Determine how trees are classified and identified. <sup>DOK3</sup></p> <ol style="list-style-type: none"><li>Compare and contrast hardwood and softwood trees.</li><li>Construct a model, drawing, or illustration showing how a tree grows.</li><li>Explain how trees reproduce by seed reproduction or vegetative reproduction.</li><li>Collect the leaves, twigs, bark, and/or fruit of local trees and identify the genus, species, and common name.<ul style="list-style-type: none"><li>Southern red oak</li><li>Loblolly pine</li><li>Water oak</li><li>Bald cypress</li><li>Southern magnolia</li><li>Eastern red cedar</li><li>Hickory</li><li>Post oak</li><li>Shortleaf pine</li></ul></li></ol>
<p>3. Apply silviculture practices to managing trees. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>Explore harvesting methods to improve the growing conditions of trees.<ul style="list-style-type: none"><li>Fertilization</li><li>Undergrowth removal</li><li>Selective cutting</li><li>Sanitation cuttings</li><li>Liberation cuttings</li><li>Thinning</li><li>Intermediate cuttings</li></ul></li><li>Explain methods of reforestation.<ul style="list-style-type: none"><li>Natural reforestation</li><li>Artificial reforestation</li></ul></li><li>Discuss fire influence on forest management.<ul style="list-style-type: none"><li>Controlled/prescribed burning</li><li>Weather influence on fire behavior</li><li>Drought</li><li>Wind speed</li></ul></li></ol>

4. Explain the parts of a management plan for a locally identified stand of trees. <sup>DOK2</sup>
- a. Identify tools used in forestry.
    - Tree scale stick
    - Dibble bar
    - Tree diameter tape
    - Increment borer
    - Clinometer
    - Altimeter
    - Bark gauge
    - Fire swatter
    - Compass
    - Densiometer
    - Measuring tape
  - b. Analyze the growth rate and age of trees by examining the annual rings and accounting for variations in growth rate due to environmental factors.
  - c. Demonstrate how to measure the diameter of a tree using various measurement methods.
  - d. Demonstrate how to measure the merchantable height of a tree.
  - e. Discuss why it is important to monitor the age, size, and growth rate of trees.
  - f. Determine the board foot volume of a stand of trees (i.e., sawtimber estimation).
  - g. Determine the cord volume of a stand of trees (i.e., pulpwood estimation).

# Unit 7: Wildlife Management

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## Competencies and Suggested Objectives

1. Explain the basic principles of plant and animal wildlife conservation and preservation, focusing on habitat, hunting regulations, artificial restocking, and game refuges. <sup>DOK2</sup>
  - a. Describe the components of a habitat.
  - b. Explain the various relationships found within an ecosystem.
  - c. Describe the factors of population ecology and how they affect the survival of a species.
    - Attributes of population
    - Population growth
    - Competition
    - Predation
  - d. Explain how a food chain and food web works. <sup>DOK2</sup>
  - e. Describe the feeding groups in a food chain and food web and cite specific examples of organisms that fit into each group.
  - f. Describe the needs and practices in conservation, preservation, and management of wildlife.
    - Game laws
    - Hunting seasons and limits
    - Habitat improvement programs
  - g. Assess the impact of artificial restocking of wildlife in natural habitats.
  - h. Investigate the history and purpose of wild game refuges.
  - i. Investigate the role of government agencies concerned with wildlife conservation.
    - Mississippi Department of Wildlife, Fisheries, and Parks
2. Examine the relationship between wildlife well-being and environmental quality. <sup>DOK3</sup>
  - a. Identify the wildlife species found in the local area and classify as terrestrial or aquatic.
  - b. Assess qualities of a local wildlife habitat for a given species.
    - Food
    - Water
    - Shelter
    - Space
    - Range
  - c. Investigate the importance of wildlife to the environment and human well-being.
    - Food
    - Clothing
    - Ornamentation
    - Medicine
    - Recreation
  - d. Identify components of wildlife management practices.
    - Harvesting (i.e., increasing or decreasing)
    - Forestry management techniques

- Establishing grasses/forbs
  - Leaving grain unharvested
  - Nesting structures
  - Plant/manage food plots
  - Plant trees/shrubs
  - Construct ponds
  - Tillage management
  - Water-control structures
  - Water development
- e. Recommend procedures for improving habitat management for specific Mississippi wildlife.
- Rabbits
  - Whitetail deer
  - Wood ducks
  - Quail
  - Largemouth bass
  - Dove
  - Wild turkey

3. Identify and illustrate the impact of agricultural pests and pest control measures on the environment. DOK2

- a. Analyze the economic impact of agricultural pests, such as wild hogs, on the environment.
- b. Relate methods of controlling agricultural pests to the impact on the environment, including integrated pest management.
- Biological
  - Chemical
  - Regulatory
  - Mechanical
  - Physical
  - Cultural

# Student Competency Profile

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Student's Name: \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Leadership and SAE for All</b>	
	1. Apply general safety precautions for the laboratory and field.
	2. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration.
	3. Identify potential college and career opportunities in agribusiness.
	4. Review the types of programs under SAE for All.
	5. Review individual plans for student Foundational SAE programs.
	6. Develop an Immersion SAE and maintain agricultural records.
<b>Unit 2: Application of Ecology to the Environment</b>	
	1. Identify ecological diversity in local agricultural and wildlife ecosystems.
	2. Distinguish between terrestrial and aquatic biomes.
	3. Compare and contrast the impact of current trends on the regulation of environmental service systems, such as climate change, population growth, and international trade.
	4. Analyze issues that affect the global environment.
<b>Unit 3: The Effects of Weather and Climate</b>	
	1. Explain how the weather and climate affect the agricultural environment.
	2. Describe how weather elements are measured and recorded.
<b>Unit 4: Soil, Land, and Mapping</b>	
	1. Investigate the physical components of soil and how they affect soil use.
	2. Demonstrate proficiency in land surveying, measurement, and mapping.
	3. Explain proper soil management.
<b>Unit 5: Water Quality Management</b>	
	1. Explain the importance of managing water quality in the environment.
	2. Describe the hydrologic cycle and how it is influenced by the environment.
	3. Research and summarize methods used to determine water quality.
	4. Describe how water is managed and how wastewater is treated to maintain water quality.



<b>Unit 6: Forest Management</b>		
	1.	Describe the importance of forests and forest management to our environment and economy.
	2.	Determine how trees are classified and identified.
	3.	Apply silviculture practices to managing trees.
	4.	Explain the parts of a management plan for a locally identified stand of trees.
<b>Unit 7: Wildlife Management</b>		
	1.	Explain the basic principles of plant and animal wildlife conservation and preservation, focusing on habitat, hunting regulations, artificial restocking, and game refuges.
	2.	Examine the relationship between wildlife well-being and environmental quality.
	3.	Identify and illustrate the impact of agricultural pests and pest control measures on the environment.

## Appendix: Industry Standards

### Framework for AFNR Content Standards and Performance Elements Crosswalk for Diversified Agriculture Environment Core

	Unit	1	2	3	4	5	6	7
AFNR								
ABS- Agribusiness Systems		X						
AS- Animal Systems								X
BS- Biotechnology								
CRP- Career Ready Practices		X	X	X	X	X	X	X
CS- AFNR Cluster Skill		X	X		X	X	X	X
ES- Environmental Service Systems		X	X	X	X	X	X	X
FPP- Food Products and Processing Systems								
NRS- Natural Resource Systems		X	X	X	X	X	X	X
PS- Plant Systems							X	
PST- Power, Structural, and Technical Systems								

### AFNR Pathway Content Standards and Performance Elements

The AFNR Pathway Content Standards and Performance Elements are adapted from *National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards*. Reprinted with permission from the National Council for Agricultural Education, 1410 King St., Suite 400, Alexandria, VA 22314, 800.772.0939. Copyright © 2015. A complete copy of the national standards can be downloaded from the Team Ag Ed Learning Center at [thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr)

**ABS AGRIBUSINESS SYSTEMS**  
**AS ANIMAL SYSTEMS**  
**BS BIOTECHNOLOGY**  
**CRP CAREER READY PRACTICES**  
**CS AGRICULTURE FOOD AND NATURAL RESOURCES CLUSTER SKILL**  
**ES ENVIRONMENTAL SERVICE SYSTEMS**  
**FPP FOOD PRODUCTS AND PROCESSING SYSTEMS**  
**NRS NATURAL RESOURCE SYSTEMS**  
**PS PLANT SYSTEMS**  
**PST POWER, STRUCTURAL, AND TECHNICAL SYSTEMS**

## Agribusiness Systems Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), and business planning, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agribusiness Systems (AG-ABS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ABS.01. CCTC Standard:** Apply management planning principles in AFNR businesses.

**ABS.01.01. Performance Indicator:** Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.

**ABS.01.02. Performance Indicator:** Read, interpret, evaluate and write statements of purpose to guide business goals, objectives and resource allocation.

**ABS.01.03. Performance Indicator:** Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.

**ABS.01.04. Performance Indicator:** Evaluate, develop and implement procedures used to recruit, train and retain productive human resources for AFNR businesses.

**ABS.02. CCTC Standard:** Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

**ABS.02.01. Performance Indicator:** Apply fundamental accounting principles, systems, tools and applicable laws and regulations to record, track and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

**ABS.02.02. Performance Indicator:** Assemble, interpret and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash-flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

**ABS.03. CCTC Standard:** Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

**ABS.03.01. Performance Indicator:** Develop, assess and manage cash budgets to achieve AFNR business goals.

**ABS.03.02. Performance Indicator:** Analyze credit needs and manage credit budgets to achieve AFNR business goals.

**ABS.04. CCTC Standard:** Develop a business plan for an AFNR business.

**ABS.04.01. Performance Indicator:** Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

**ABS.04.02. Performance Indicator:** Develop production and operational plans for an AFNR business.

**ABS.04.03. Performance Indicator:** Identify and apply strategies to manage or mitigate risk.

**ABS.05. CCTC Standard:** Use sales and marketing principles to accomplish AFNR business objectives.

**ABS.05.01. Performance Indicator:** Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.

**ABS.05.02. Performance Indicator:** Assess and apply sales principles and skills to accomplish AFNR business objectives.

**ABS.05.03. Performance Indicator:** Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

## Animal Systems Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, and management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Animal Systems (AG-AS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**AS.01. CCTC Standard:** Analyze historic and current trends impacting the animal systems industry.

**AS.01.01. Performance Indicator:** Evaluate the development and implications of animal origin, domestication and distribution on production practices and the environment.

**AS.01.02. Performance Indicator:** Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.

- AS.01.03. Performance Indicator:** Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.
- AS.02. CCTC Standard:** Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.
- AS.02.01. Performance Indicator:** Demonstrate management techniques that ensure animal welfare.
- AS.02.02. Performance Indicator:** Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).
- AS.03. CCTC Standard:** Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.
- AS.03.01. Performance Indicator:** Analyze the nutritional needs of animals.
- AS.03.02 Performance Indicator:** Analyze feed rations and assess if they meet the nutritional needs of animals.
- AS.03.03 Performance Indicator:** Utilize industry tools to make animal nutrition decisions.
- AS.04. CCTC Standard:** Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.
- AS.04.01. Performance Indicator:** Evaluate animals for breeding readiness and soundness.
- AS.04.02. Performance Indicator:** Apply scientific principles to select and care for breeding animals.
- AS.04.03 Performance Indicator:** Apply scientific principles to breed animals.
- AS.05. CCTC Standard:** Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.
- AS.05.01. Performance Indicator:** Design animal housing, equipment and handling facilities for the major systems of animal production.
- AS.05.02. Performance Indicator:** Comply with government regulations and safety standards for facilities used in animal production.
- AS.06. CCTC Standard:** Classify, evaluate and select animals based on anatomical and physiological characteristics.
- AS.06.01. Performance Indicator:** Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).
- AS.06.02. Performance Indicator:** Apply principles of comparative anatomy and physiology to uses within various animal systems.
- AS.06.03. Performance Indicator:** Select and train animals for specific purposes and maximum performance based on anatomy and physiology.
- AS.07. CCTC Standard:** Apply principles of effective animal health care.
- AS.07.01. Performance Indicator:** Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

**AS.07.02. Performance Indicator:** Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

**AS.08. CCTC Standard:** Analyze environmental factors associated with animal production.

**AS.08.01. Performance Indicator:** Design and implement methods to reduce the effects of animal production on the environment.

**AS.08.02. Performance Indicator:** Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

## **Common Career Technical Core Career Ready Practices Content Standards**

The CCTC CRPs encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical-thinking, problem solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

**DEFINITIONS:** Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for CRPs from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a CTE program of study.

**CRP.01. CCTC Standard:** Act as a responsible and contributing citizen and employee.

**CRP.01.01. Performance Indicator:** Model personal responsibility in the workplace and community.

**CRP.01.02 Performance Indicator:** Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.

**CRP.01.03. Performance Indicator:** Identify and act upon opportunities for professional and civic service at work and in the community.

**CRP.02. CCTC Standard:** Apply appropriate academic and technical skills.

**CRP.02.01. Performance Indicator:** Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

**CRP.02.02. Performance Indicator:** Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

**CRP.03. CCTC Standard:** Attend to personal health and financial well-being.

**CRP.03.01. Performance Indicator:** Design and implement a personal wellness plan.

**CRP.03.02. Performance Indicator:** Design and implement a personal financial management plan.

**CRP.04. CCTC Standard:** Communicate clearly, effectively and with reason.

**CRP.04.01. Performance Indicator:** Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

**CRP.04.02. Performance Indicator:** Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

**CRP.04.03. Performance Indicator:** Model active listening strategies when interacting with others in formal and informal settings.

**CRP.05. CCTC Standard:** Consider the environmental, social and economic impacts of decisions.

**CRP.05.01. Performance Indicator:** Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.

**CRP.05.02. Performance Indicator:** Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

**CRP.06. CCTC Standard:** Demonstrate creativity and innovation.

**CRP.06.01. Performance Indicator:** Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

**CRP.06.02. Performance Indicator:** Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

**CRP.06.03. Performance Indicator:** Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

**CRP.07. CCTC Standard:** Employ valid and reliable research strategies.

**CRP.07.01. Performance Indicator:** Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

**CRP.07.02. Performance Indicator:** Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

**CRP.08. CCTC Standard:** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP.08.01. Performance Indicator:** Apply reason and logic to evaluate workplace and community situations from multiple perspectives.

**CRP.08.02. Performance Indicator:** Investigate, prioritize and select solutions to solve problems in the workplace and community.

**CRP.08.03. Performance Indicator:** Establish plans to solve workplace and community problems and execute them with resiliency.

**CRP.09. CCTC Standard:** Model integrity, ethical leadership and effective management.

**CRP.09.01. Performance Indicator:** Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

**CRP.09.02. Performance Indicator:** Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

**CRP.09.03. Performance Indicator:** Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

**CRP.10. CCTC Standard:** Plan education and career path aligned to personal goals.

**CRP.10.01. Performance Indicator:** Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

**CRP.10.02. Performance Indicator:** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

**CRP.10.03. Performance Indicator:** Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

**CRP.10.04. Performance Indicator:** Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

**CRP.11. CCTC Standard:** Use technology to enhance productivity.

**CRP.11.01. Performance Indicator:** Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

**CRP.11.02. Performance Indicator:** Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.

**CRP.12. CCTC Standard:** Work productively in teams while using cultural/global competence.

**CRP.12.01. Performance Indicator:** Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

**CRP.12.02. Performance Indicator:** Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

## **Agriculture, Food, and Natural Resources Cluster Skill Content Standards**

The AFNR Cluster Skills (CS) encompasses the study of fundamental knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career



pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agriculture, Food and Natural Resources Career Cluster® (AG) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**CS.01. CCTC Standard:** Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

**CS.01.01. Performance Indicator:** Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

**CS.01.02. Performance Indicator:** Examine technologies and analyze their impact on AFNR systems.

**CS.01.03. Performance Indicator:** Identify public policies and examine their impact on AFNR systems.

**CS.02. CCTC Standard:** Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

**CS.02.01. Performance Indicator:** Research and use geographic and economic data to solve problems in AFNR systems.

**CS.02.02. Performance Indicator:** Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

**CS.03. CCTC Standard:** Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

**CS.03.01. Performance Indicator:** Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.

**CS.03.02. Performance Indicator:** Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

**CS.03.03. Performance Indicator:** Apply health and safety practices to AFNR workplaces.

**CS.03.04. Performance Indicator:** Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

- CS.04. CCTC Standard:** Demonstrate stewardship of natural resources in AFNR activities.
- CS.04.01. Performance Indicator:** Identify and implement practices to steward natural resources in different AFNR systems.
- CS.04.02. Performance Indicator:** Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.
- CS.05. CCTC Standard:** Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
- CS.05.01. Performance Indicator:** Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).
- CS.06. CCTC Standard:** Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.
- CS.06.01. Performance Indicator:** Examine and explain foundational cycles and systems of AFNR.
- CS.06.02. Performance Indicator:** Analyze and explain the connection and relationships between different AFNR systems on a national and global level.

## Biotechnology Systems Career Pathway Content Standards

The Biotechnology Systems (BS) Career Pathway encompasses the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- **National Council for Agricultural Education (NCAE) Standard\*** – These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying biotechnology to AFNR systems.
  - **Performance Indicators** – These statements distill each performance element into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related performance element at the conclusion of a program of study in this area.
- BS.01. NCAE Standard:** Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).
- BS.01.01. Performance Indicator:** Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).

**BS.01.02. Performance Indicator:** Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).

**BS.01.03. Performance Indicator:** Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

**BS.02. NCAE Standard:** Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

**BS.02.01. Performance Indicator:** Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.

**BS.02.02. Performance Indicator:** Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.

**BS.02.03. Performance Indicator:** Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

**BS.02.04. Performance Indicator:** Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

**BS.02.05. Performance Indicator:** Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

**BS.03. NCAE Standard:** Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

**BS.03.01. Performance Indicator:** Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

**BS.03.02. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

**BS.03.03. Performance Indicator:** Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

**BS.03.04. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

**BS.03.05. Performance Indicator:** Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).

**BS.03.06. Performance Indicator:** Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

## Environmental Service Systems Career Pathway Content Standards

The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Environmental Service Systems (AG-ESS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ESS.01. CCTC Standard:** Use analytical procedures and instruments to manage environmental service systems.

**ESS.01.01. Performance Indicator:** Analyze and interpret laboratory and field samples in environmental service systems.

**ESS.01.02. Performance Indicator:** Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

**ESS.02. CCTC Standard:** Evaluate the impact of public policies and regulations on environmental service system operations.

**ESS.02.01. Performance Indicator:** Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.

**ESS.02.02. Performance Indicator:** Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).

**ESS.02.03. Performance Indicator:** Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

**ESS.03. CCTC Standard:** Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

**ESS.03.01. Performance Indicator:** Apply meteorology principles to environmental service systems.

**ESS.03.02. Performance Indicator:** Apply soil science and hydrology principles to environmental service systems.

**ESS.03.03. Performance Indicator:** Apply chemistry principles to environmental service systems.

**ESS.03.04. Performance Indicator:** Apply microbiology principles to environmental service systems.

**ESS.03.05. Performance Indicator:** Apply ecology principles to environmental service systems.

**ESS.04. CCTC Standard:** Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

**ESS.04.01. Performance Indicator:** Use pollution control measures to maintain a safe facility and environment.

**ESS.04.02. Performance Indicator:** Manage safe disposal of all categories of solid waste in environmental service systems.

**ESS.04.03. Performance Indicator:** Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

**ESS.04.04. Performance Indicator:** Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.

**ESS.05. CCTC Standard:** Use tools, equipment, machinery and technology common to tasks in environmental service systems.

**ESS.05.01. Performance Indicator:** Use technological and mathematical tools to map land, facilities and infrastructure for environmental service systems.

**ESS.05.02. Performance Indicator:** Perform assessments of environmental conditions using equipment, machinery and technology.

## **Food Products and Processing Systems Career Pathway Content Standards**

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety and sanitation; nutrition, biology, microbiology, chemistry and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Food Products and Processing Systems (AG-FPP) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to

demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**FPP.01. CCTC Standard:** Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

**FPP.01.01. Performance Indicator:** Analyze and manage operational and safety procedures in food products and processing facilities.

**FPP.01.02. Performance Indicator:** Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

**FPP.01.03. Performance Indicator:** Apply food safety procedures when storing food products to ensure food quality.

**FPP.02. CCTC Standard:** Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

**FPP.02.01. Performance Indicator:** Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.02. Performance Indicator:** Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.03. Performance Indicator:** Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.03. CCTC Standard:** Select and process food products for storage, distribution and consumption.

**FPP.03.01. Performance Indicator:** Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

**FPP.03.02. Performance Indicator:** Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

**FPP.03.03. Performance Indicator:** Create food distribution plans and procedures to ensure safe delivery of food products.

**FPP.04. CCTC Standard:** Explain the scope of the food industry and the historical and current developments of food product and processing.

**FPP.04.01. Performance Indicator:** Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

**FPP.04.02. Performance Indicator:** Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

**FPP.04.03. Performance Indicator:** Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

## Natural Resource Systems Career Pathway Content Standards

The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of natural resource systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Natural Resource Systems (AG-NRS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**NRS.01. CCTC Standard:** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

**NRS.01.01. Performance Indicator:** Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.

**NRS.01.02. Performance Indicator:** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.

**NRS.01.03. Performance Indicator:** Apply ecological concepts and principles to atmospheric natural resource systems.

**NRS.01.04. Performance Indicator:** Apply ecological concepts and principles to aquatic natural resource systems.

**NRS.01.05. Performance Indicator:** Apply ecological concepts and principles to terrestrial natural resource systems.

**NRS.01.06. Performance Indicator:** Apply ecological concepts and principles to living organisms in natural resource systems.

**NRS.02. CCTC Standard:** Analyze the interrelationships between natural resources and humans.

**NRS.02.01. Performance Indicator:** Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).

**NRS.02.02. Performance Indicator:** Assess the impact of human activities on the availability of natural resources.

**NRS.02.03. Performance Indicator:** Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.

**NRS.02.04. Performance Indicator:** Examine and explain how economics affects the use of natural resources.

**NRS.02.05. Performance Indicator:** Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

**NRS.03. CCTC Standard:** Develop plans to ensure sustainable production and processing of natural resources.

**NRS.03.01. Performance Indicator:** Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

**NRS.03.02. Performance Indicator:** Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

**NRS.04. CCTC Standard:** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

**NRS.04.01. Performance Indicator:** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

**NRS.04.02. Performance Indicator:** Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

**NRS.04.03. Performance Indicator:** Prevent or manage introduction of ecologically harmful species in a particular region.

**NRS.04.04. Performance Indicator:** Manage fires in natural resource systems.

## Plant Science Systems Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Plant Systems (AG-PS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.



- PS.01. CCTC Standard:** Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- PS.01.01. Performance Indicator:** Determine the influence of environmental factors on plant growth.
- PS.01.02. Performance Indicator:** Prepare and manage growing media for use in plant systems.
- PS.01.03. Performance Indicator:** Develop and implement a fertilization plan for specific plants or crops.
- PS.02. CCTC Standard:** Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.01. Performance Indicator:** Classify plants according to taxonomic systems.
- PS.02.02. Performance Indicator:** Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Performance Indicator:** Apply knowledge of plant physiology and energy conversion to plant systems.
- PS.03. CCTC Standard:** Propagate, culture and harvest plants and plant products based on current industry standards.
- PS.03.01. Performance Indicator:** Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Performance Indicator:** Develop and implement a management plan for plant production.
- PS.03.03. Performance Indicator:** Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Performance Indicator:** Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Performance Indicator:** Harvest, handle and store crops according to current industry standards.
- PS.04. CCTC Standard:** Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- PS.04.01. Performance Indicator:** Evaluating, identifying and preparing plants to enhance an environment.
- PS.04.02. Performance Indicator:** Create designs using plants.

## Power, Structural and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Power, Structural and Technical Systems (AG-PST) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**PST.01. CCTC Standard:** Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

**PST.01.01. Performance Indicator:** Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.

**PST.01.02. Performance Indicator:** Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.

**PST.01.03. Performance Indicator:** Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).

**PST.02. CCTC Standard:** Operate and maintain AFNR mechanical equipment and power systems.

**PST.02.01. Performance Indicator:** Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.

**PST.02.02. Performance Indicator:** Operate machinery and equipment while observing all safety precautions in AFNR settings.

**PST.03. CCTC Standard:** Service and repair AFNR mechanical equipment and power systems.

**PST.03.01. Performance Indicator:** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.

**PST.03.02. Performance Indicator:** Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.

**PST.03.03. Performance Indicator:** Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

**PST.04. CCTC Standard:** Plan, build and maintain AFNR structures.

**PST.04.01. Performance Indicator:** Create sketches and plans for AFNR structures.

**PST.04.02. Performance Indicator:** Determine structural requirements, specifications and estimate costs for AFNR structures

**PST.04.03. Performance Indicator:** Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).

**PST.04.04. Performance Indicator:** Apply electrical wiring principles in AFNR structures.

**PST.05. CCTC Standard:** Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.

**PST.05.01. Performance Indicator:** Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

**PST.05.02. Performance Indicator:** Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.

**PST.05.03. Performance Indicator:** Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.





## 2022 Diversified Agriculture Agribusiness Core

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE diversified agriculture agribusiness core curriculum is aligned to the following standards:

## **National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards**

The National AFNR Career Cluster Content Standards were developed by the National Council on Agricultural Education to serve as a guide for what students should know or be able to do through a study of agriculture in Grades 9-12 and two-year postsecondary programs. The standards were extensively researched and reviewed by leaders in the agricultural industry, secondary and postsecondary instructors, and university specialists. The standards consist of a pathway content standard for each of the eight career pathways. For each content standard, performance elements representing major topic areas with accompanying performance indicators were developed. Measurements of assessment of the performance elements and performance indicators were developed at the basic, intermediate, and advanced levels. The National AFNR Career Cluster Content Standards are copyrighted by the National Council for Agricultural Education and used with permission.

[thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr)

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oe/college-and-career-readiness-standards](http://mdek12.org/oe/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

The diversified agriculture agribusiness core is a one-Carnegie unit course within the diversified agriculture pathway. Students must earn four credits within the diversified agriculture pathway to be a completer. All students must complete the principles of agriscience course before being allowed to enroll in agribusiness core. Agribusiness core is centered on building a foundation of knowledge regarding agribusiness practices, financial management, and entrepreneurship. Students will attain knowledge and skills in areas such as utilizing banking services, financial management, preparing budgets, and principles of marketing. Emphasis is on an active learning environment enriched with technology, business simulations, and math-based applications.

## College, Career, and Certifications

No national industry-recognized certifications are known to exist at this time in the field of agribusiness. Competencies and suggested objectives in this course have been correlated, however, to the National AFNR Career Cluster Content Standards that have been reviewed and endorsed at the national level by the National Council on Agricultural Education.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
  2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
  3. Instructor approval and TABE reading score (eighth grade or higher)
- or**
1. TABE reading and math score (eighth grade or higher)
  2. Instructor approval
- or**
1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Applied Academic Credit

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

### **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

### **Professional Learning**

If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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This curriculum consists of one 1-credit course.

**Diversified Agriculture Agribusiness Core—Course Code: **New Course Code****

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Leadership and SAE for All	5
2	Principles of Agribusiness and Entrepreneurship	10
3	Financial Management in Agribusiness	20
4	Examine Financial Performance	20
5	Taxes and Legal Concepts	10
6	Agricultural Economics	15
7	Risk Management in Agribusiness	10
8	Implementing, Planning, and Decision-Making Procedures Through Budgeting	15
9	Establishing an Agribusiness	15
10	Agribusiness Marketing and Sales	10
11	Management and Administration of Agribusiness	10
<b>Total</b>		<b>140</b>

# Career Pathway Outlook

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## Overview

The agricultural sciences career cluster covers the broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. According to the U.S. Department of Agriculture (USDA), through 2025, 59,400 jobs are expected to open in food, agriculture, renewable natural resources, or the environment for graduates with bachelor's or higher degrees in those areas. Almost half of those jobs will be in management and business at 42%; 31% in science, technology, engineering, and math (STEM) in agriculture; 13% in sustainable food and biomaterials production; and 14% in education, communication, and government services. According to the USDA, agriculture, food, and related industries contributed \$1.1 trillion to the U.S. gross domestic product (GDP) in 2019. The Mississippi Department of Agriculture and Commerce (MDAC) reports that agriculture is Mississippi's number one industry at \$7.4 billion and employing approximately 17.4% of the state's workforce.

Diversified agriculture will target careers at the professional and technical levels in agriculture. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college levels.

## Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (MDES) (2016). Employment opportunities for each of the occupations are listed below:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Yearly Earnings, 2020
Agricultural and Food Science Technicians	260	270	10	3.9%	\$39,270
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7%	\$93,260
Animal Trainers	100	110	10	10%	\$23,120
Career/Technical Education Teachers, Middle School	320	350	30	9.4%	\$47,270
Career/Technical Education Teachers, Secondary School	1220	1310	90	7.4%	\$50,370
Conservation Scientists	700	730	30	4.3%	\$54,950
Environmental Engineers	410	420	10	2.4%	\$75,940
Environmental Engineering Technicians	160	170	10	6.3%	\$46,790

Environmental Scientists and Specialists, Including Health	620	670	50	8.1%	\$64,460
Environmental Science and Protection Technicians, Including Health	420	460	40	9.5%	\$38,780
Farm and Home Management Advisors	290	300	10	3.2%	\$38,650
Logging Equipment Operators	1,680	1,740	60	3.6%	\$41,840
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3%	\$25,630
Nonfarm Animal Caretakers	1,520	1,780	260	17.1%	\$24,030
Soil and Plant Scientists	110	110	0	0%	\$92,250
Farmers, Ranchers, and Other Agricultural Managers	1,790	1,840	20	2.8%	\$55,830
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2%	\$40,270
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	940	990	50	5.3%	\$54,550
Fish and Game Wardens	40	40	0	0%	\$46,610
Foresters	190	200	10	5.3%	\$52,660
Surveyors	450	470	20	4.4%	\$48,600
Surveying and Mapping Technicians	530	550	20	3.8%	\$39,840
Tree Trimmers and Pruners	270	300	30	11.1%	\$44,920
Veterinarians	490	540	50	10.2%	\$81,950
Veterinary Assistants and Laboratory Animal Caretakers	970	1,090	120	12.4%	\$26,150
Veterinary Technologists and Technicians	570	630	60	10.5%	\$35,890
Zoologists and Wildlife Biologists	260	270	10	3.9%	\$70,200

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).



### **Perkins V Requirements and Academic Infusion**

The agribusiness core curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in agricultural fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for careers in agriculture. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

### **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## Best Practices

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The diversified agriculture educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. The National FFA Organization is the student organization for this pathway and will foster the types of learning expected from the diversified agriculture curriculum. FFA provides students with growth opportunities and competitive events and opens the doors to the world of agriculture and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The diversified agriculture curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the curriculum that will allow and encourage collaboration with professionals currently in the agriscience field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the diversified agriculture classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and agriscience professionals. Thus, supervised collaboration and immersion into the agriculture industry around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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American Association for Agricultural Education (AAAE)

[aaaeonline.org](http://aaaeonline.org)

Association for Career and Technical Education (ACTE)

[acteonline.org](http://acteonline.org)

Mississippi ACTE

[mississippiacte.com](http://mississippiacte.com)

Mississippi FFA/ Mississippi Association of Vocational Agriculture Teachers (MAVAT)

[mississippiffa.org](http://mississippiffa.org)

National FFA Organization

[ffa.org](http://ffa.org)

National Association of Agricultural Educators (NAAE)

[naae.org](http://naae.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the agribusiness core program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the agribusiness core program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Leadership and SAE for All

---

## Competencies and Suggested Objectives

1. Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration. <sup>DOK3</sup>
  - a. Actively participate in FFA activities.
    - Leadership Development Events (LDE)
    - Career Development Events (CDE)
      - Farm Business Management
      - Agricultural Sales
      - Agricultural Issues
      - Marketing Plan
    - Leadership retreats or conferences
    - Industry-related seminars, workshops, or conferences
    - Other related FFA activities
2. Identify potential college and career opportunities in agribusiness. <sup>DOK2</sup>
  - a. Research postsecondary institutions that offer studies in agribusiness or a related field and prepare a two- to three-minute speech on their programs and potential career choices.
  - b. Complete applications for college admission and scholarships.
  - c. Revise a personal résumé for the purpose of applying for a specific job.
  - d. Complete a job application for employment.
  - e. Participate in a mock or real interview.
3. Review the types of programs under Supervised Agricultural Experience (SAE) for All. <sup>DOK1</sup>
  - a. Explore concepts of a Foundational SAE.
    - Career exploration and planning
    - Employability skills for college and career readiness
    - Personal financial management and planning
    - Workplace safety
    - Agricultural literacy
  - b. Explore concepts of an Immersion SAE.
    - Placement/internship
    - Ownership/entrepreneurship
    - Research
      - Experimental
      - Analytical
      - Invention
    - School-based enterprise
    - Service learning

- |  |
|--|
| <p>4. Review individual plans for student Foundational SAE programs. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>a. Assess goal attainment in SAE from the previous year.</li><li>b. Review and update short- and long-range goals pertaining to the SAE program.</li></ol>  |
| <p>5. Develop an Immersion SAE and maintain agricultural records. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>a. Redefine and adjust requirements of agreements between student, parents, supervisor, and/or employer.</li><li>b. Utilize an electronic/computer-based system of record keeping.</li><li>c. Update SAE records.<ul style="list-style-type: none"><li>• SAE program goals</li><li>• Student inventory related to the SAE program</li><li>• Expense records</li><li>• Income/gift and scholarship records</li><li>• Skill-attainment records</li><li>• Leadership-activity records and participation in FFA activities</li><li>• Community service hours</li></ul></li><li>d. Complete degree and proficiency award applications as they apply to the SAE.</li></ol> |

## Unit 2: Principles of Agribusiness and Entrepreneurship

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<b>Competencies and Suggested Objectives</b>	
1. Describe various types of agribusinesses. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Compare and contrast sole proprietorships, partnerships, corporations, entrepreneurships, and cooperatives.</li><li>b. Describe the concept of a limited liability company or partnership.</li><li>c. Investigate the advantages and disadvantages of a franchise business.</li><li>d. Explore the concept of e-commerce in agribusiness.</li><li>e. Identify the steps in starting a cooperative.</li></ol>
2. Explore the concept and principles of entrepreneurship. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>a. Describe agribusiness management and entrepreneurship.</li><li>b. Investigate the rewards and risks of entrepreneurship.</li><li>c. Identify the characteristics of successful entrepreneurs.<ul style="list-style-type: none"><li>• Independence</li><li>• Self-confidence</li><li>• Organization</li><li>• Vision</li><li>• Commitment</li><li>• Problem-solving</li><li>• Risk management</li><li>• Action-oriented</li><li>• Flexibility</li></ul></li></ol>
3. Identify and explain the scope and importance of agribusiness. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>a. Identify the success of agribusiness in the local community, state, nation, and world.</li><li>b. Explain the size and importance of production agriculture.</li><li>c. Explain the importance of the agribusiness sectors.<ul style="list-style-type: none"><li>• New product development and marketing</li><li>• Public agriculture groups that provide leadership at the federal, state, and local levels (e.g., USDA, U.S. Food and Drug Administration (FDA), Department of Commerce)</li><li>• Private agriculture groups (e.g., financial services, trade associations, agriculture cooperatives, etc.)</li></ul></li></ol>

## Unit 3: Financial Management in Agribusiness

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<b>Competencies and Suggested Objectives</b>	
1. Describe the characteristics and functions of various financial institutions. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Determine factors in selecting financial institutions.</li><li>Explore the types of business services offered by various financial institutions.</li></ol>
2. Explore banking services for personal and business accounts. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Identify common types of personal savings and checking options.</li><li>Create and maintain a transaction register.</li><li>Demonstrate how to write a check.</li><li>Demonstrate how to write a deposit slip.</li><li>Reconcile a bank statement.</li><li>Investigate online banking services, including online security, identity theft, and fraud-prevention procedures.</li></ol>
3. Explore concepts of credit. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Identify and compare sources of credit (e.g., credit card, bank, finance company, credit union, government agency, etc.).</li><li>Describe factors that indicate a good credit rating (e.g., returns, repayment capacity, risk, etc.).</li><li>Discuss guidelines for wise use of credit.</li><li>Describe procedures for obtaining credit.</li><li>Explain how credit is used in the decision-making process.</li></ol>
4. Compare loan options. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Discuss the different uses of business and personal loan funds.</li><li>Describe procedures for obtaining agribusiness loans.</li><li>Identify the types of collateral that can be used to obtain a loan.</li><li>Calculate the cost of a loan.</li><li>Explain the process of filling out a loan application.</li></ol>
5. Investigate the various types of investment opportunities. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Explore common personal investment options (e.g., certificate of deposit, Individual Retirement Account (IRA), Transitional Service Agreement (TSA), stocks and bonds, mutual funds, etc.).</li><li>Explore basic principles of interest.</li><li>Explain time value of money (i.e., compounding and discounting).</li><li>Calculate the time value of money for a given amount of money using the concept of amortization.</li></ol>



## Unit 4: Examine Financial Performance

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### Competencies and Suggested Objectives

1. Describe basic record-keeping principles. <sup>DOK2</sup>
  - a. Discuss the purpose of keeping records.
  - b. Define terms associated with keeping financial records.
    - Accounting
    - Bookkeeping
    - Cash accounting
    - Accrual accounting
    - Whole-business records
    - Enterprise records
    - Income
    - Expenses
    - Inventory
    - Capital
    - Assets
    - Liabilities
    - Depreciation
  - c. Compare the types of accounting and bookkeeping systems used in agribusiness.
  - d. Differentiate between accounting and bookkeeping.
  - e. Explain why financial records are necessary.
  - f. Describe the accounting cycle (i.e., calendar and fiscal year).
  - g. Differentiate between bookkeeping and journals.
  - h. Differentiate between the cash and accrual accounting systems.
  - i. Differentiate between whole-business records and enterprise records.
2. Maintain records of income and expenses. <sup>DOK2</sup>
  - a. Identify business and nonbusiness income.
  - b. Identify business and nonbusiness expenses.
  - c. Set up and maintain records of income and expenses (e.g., personal use, enterprise, business, etc.).
3. Apply basic inventory principles. <sup>DOK2</sup>
  - a. Describe the uses of an inventory.
  - b. Distinguish between liquid assets, consumable supplies, capital, and noncapital assets.
  - c. Determine when to inventory (i.e., calendar or fiscal year).
  - d. Determine inventory values of non-depreciable and depreciable assets.
  - e. Explain depreciation on capital goods.
  - f. Define terms associated with depreciation, including write-off, capital goods, salvage value, and useful life.
  - g. Compare methods of depreciation (i.e., straight line vs. accelerated).
  - h. Calculate inventory values of depreciable assets using the straight-line depreciation method.

- |   |
|---|
| <p>4. Examine a balance sheet (i.e., net worth statement). <sup>DOK3</sup></p> <ol style="list-style-type: none"><li>Differentiate between current and noncurrent assets and liabilities.</li><li>Calculate the net worth of a business using a balance sheet.</li><li>Analyze a statement of owner equity for an agribusiness.</li><li>Relate the concepts of liquidity, solvency, and equity to assets, liabilities, and net worth. Evaluate the financial standing of a given agribusiness using various financial analysis ratios.<ul style="list-style-type: none"><li>Solvency (debt-asset ratio)</li><li>Liquidity (current ratio)</li><li>Profitability (return on assets ratio)</li><li>Repayment capacity</li><li>Financial efficiency (asset turnover ratio)</li></ul></li></ol> |
| <p>5. Examine an income statement. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>Differentiate between operating expenses, operating income, and revenue.</li><li>Summarize income and expenses.</li><li>Calculate profit or loss using an income statement.</li><li>Determine gross revenue.</li></ol>   |
| <p>6. Examine a statement of cash flow. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>Compare the statement of cash flow to the cash flow statement.</li><li>Identify the three categories found on a statement of cash flow (i.e., operating, investing, and financing).</li><li>Interpret a statement of cash flow.</li></ol>   |

## Unit 5: Taxes and Legal Concepts

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<b>Competencies and Suggested Objectives</b>	
1. Manage personal income taxes. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Prepare a W-4 to authorize withholding of income taxes from a paycheck.</li><li>Calculate take-home pay for a given period.</li><li>Complete a federal and state itemized and non-itemized tax form. (e.g., 1040).</li></ol>
2. Manage business taxes. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>Identify types of business taxes (e.g., sales tax, property tax, licenses and permits, income taxes, etc.).</li><li>Describe using Schedule F and Schedule C forms to report and pay business taxes).</li></ol>
3. Describe common legal issues and documents and their applications. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Identify and describe the essential elements of a contract.</li><li>Compare warranty deeds and quitclaim deeds.</li><li>Discuss the purpose and features of a promissory note and a mortgage.</li><li>Describe the purpose and features of a bill of sale.</li><li>Complete a lease or rental agreement.</li></ol>
4. Describe safety and health regulations related to agribusinesses. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>Discuss the functions and legality of local, state, and federal agencies that regulate safety and health issues for agribusinesses (e.g., Department of Health, Department of Environmental Quality, Environmental Protection Agency, Occupational Safety and Health Administration, FDA, USDA, Mississippi Department of Agriculture and Commerce).</li></ol>

# Unit 6: Agricultural Economics

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## Competencies and Suggested Objectives

1. Distinguish among basic economic principles in agribusiness. <sup>DOK2</sup>
  - a. Construct a definition of economics.
  - b. Describe the three major components of economics (i.e., scarcity, types of resources, and wants and needs).
  - c. Discuss three basic economic questions that affect an agribusiness.
    - What goods should be produced, and how much?
    - How will they be produced?
    - Who should get what, and how much?
  - d. Explain the six types of economic systems.
    - Traditional system
    - Mixed economic system
    - Capitalism
    - Socialism
    - Fascism
    - Communism
  - e. Describe the characteristics of the economy in the United States (i.e., little or no government control, freedom of enterprise and choice, right to own property, profit incentives, and chance of competition).
  - f. Differentiate between macroeconomics and microeconomics in agribusiness.
2. Explain an agribusiness enterprise. <sup>DOK2</sup>
  - a. Discuss how to distinguish among enterprises.
  - b. Describe the difference between specialization enterprises and diversification in enterprises.
  - c. Explain equimarginal returns regarding selecting enterprises.
3. Apply economic principles as they relate to business management. <sup>DOK3</sup>
  - a. Identify and characterize the three stages of production (i.e., increasing marginal returns, decreasing marginal returns, and negative marginal returns).
  - b. Understand production functions, such as diminishing returns and the profit-maximizing point.
  - c. Describe opportunity costs in terms of alternative investment opportunities and alternative use of resources.
  - d. Prepare a cost analysis of a product or service, including fixed and variable costs.
  - e. Describe the law of supply and demand as it relates to the agricultural industry.
    - Explain the law of supply.
    - Explain the law of demand.
    - Illustrate the relationship between supply and demand.
    - Describe elasticity in supply and demand.
    - Discuss substitute, complementary, and competitive products.
    - Describe what a comparative advantage means.
  - f. Classify inputs and outputs in a business.
  - g. Calculate average product, marginal factor cost, and marginal value product.
  - h. Calculate short-run costs, total costs, average total costs, and marginal costs.

## Unit 7: Risk Management in Agribusiness

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<b>Competencies and Suggested Objectives</b>	
1. Assess financial risk factors in agribusiness management. <sup>DOK3</sup>	
a. Explain why there are financial risks associated with business.	
b. Explain risk/return trade-off.	
2. Discuss the risks associated with capital resources in agribusiness. <sup>DOK2</sup>	
a. Discuss the basic concepts of insurance, including risk management.	
b. Describe the advantages and disadvantages of leasing real property.	
c. Evaluate the importance of a machinery maintenance and management plan.	
d. Explain the risks associated with land acquisition and ownership.	
e. Discuss the concepts of leverage and risk as associated with the use of capital.	
f. Explain the importance of insuring the assets of an agribusiness.	
• Personal insurance policies (e.g., cancer, medical, life, etc.)	
• Property insurance	
• Crop insurance	
• Liability insurance	
g. Compare insurance coverages for specific needs (e.g., liability, disaster, full coverage, etc.).	
3. Evaluate production risks associated with agribusiness management. <sup>DOK2</sup>	
a. Explain how the weather, diseases, and pests pose a risk to agribusinesses.	

## Unit 8: Implementing, Planning, and Decision-Making Procedures Through Budgeting

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<b>Competencies and Suggested Objectives</b>	
1.	Construct specific, measurable, attainable, realistic, and timely (SMART) goals for an agribusiness. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Write SMART short-term goals for the specific business.</li><li>Write SMART long-term goals for the specific business.</li></ol>
2.	Examine the importance of personal budgeting. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Discuss the importance of planning a personal budget.</li><li>Identify and categorize personal income and expense items for a period of time.</li><li>Calculate annual income based on different hourly wages.</li><li>Prepare a personal budget, including savings and investments.</li></ol>
3.	Discuss and demonstrate budgeting in an agribusiness. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Describe the basic purposes and principles of budgeting.</li><li>Differentiate between fixed costs and variable costs in an agribusiness.</li><li>Describe the three types of budgets.<ul style="list-style-type: none"><li>Operating budget</li><li>Cash flow budget</li><li>Capital expenditures budget</li></ul></li><li>Compare the characteristics of operating budgets, cash flow budgets, and capital expenditures budgets.</li><li>Describe the four types of budgets for an agribusiness.<ul style="list-style-type: none"><li>Enterprise budget</li><li>Whole-farm budget</li><li>Partial budget</li><li>Cash flow budget</li></ul></li><li>Distinguish between partial budgets, whole-farm budgets, and enterprise budgets in agribusiness.</li><li>Prepare an enterprise budget, a partial budget, and a cash flow budget related to selected agribusiness scenarios.</li></ol>
4.	Utilize a budget in the decision-making process. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Explain the steps in the problem-solving/decision-making process.</li><li>Apply the decision-making process to a problem scenario.</li></ol>

## Unit 9: Establishing an Agribusiness

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<b>Competencies and Suggested Objectives</b>	
1. Develop a concept for an agribusiness. <sup>DOK3</sup>	
2. Prepare a business plan for the agribusiness. <sup>DOK4</sup>	
a. Write an introduction for the plan, describing the business concept.	
b. Prepare a description of the proposed business.	
c. Identify key people who will manage the business, including job descriptions and an organizational chart.	
d. Explain how the day-to-day operation of the business will be managed.	
e. Construct a marketing plan, explaining who the customers are, who the competition will be, and the strengths and weaknesses of the product on the market.	
f. Describe the type of business organization the business will model.	
g. Describe the physical or virtual location of the business.	
h. Investigate what business regulations will apply to this type of business.	
i. Develop a financial plan for the business, including up to a five-year projection for income, expenses, and profits.	
j. Estimate the amount of money or capital it will take to start the business.	
k. Describe how the business will be financed.	
l. Assess the competition for the business.	
m. Research the market for this type of business to show a need for the product or service the business will provide.	
3. Evaluate a business plan for an agricultural enterprise. <sup>DOK3</sup>	
a. Analyze the business plan for a local agricultural enterprise or business and determine whether the plan should be approved, improved, or rejected.	

# Unit 10: Agribusiness Marketing and Sales

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<b>Competencies and Suggested Objectives</b>
1. Explain agribusiness marketing. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Describe agricultural marketing.</li><li>Contrast the difference between selling and marketing.</li><li>Identify various markets and marketing options (e.g., retail, wholesale, direct, cooperative, online/e-commerce, etc.).</li><li>Identify the marketing channels from farmer to consumer.<ul style="list-style-type: none"><li>Livestock and dairy</li><li>Grain</li><li>Fruit and vegetable</li><li>Specialty</li></ul></li><li>Investigate the importance of international marketing of agricultural products.</li></ol>
2. Develop a basic marketing plan for a local business. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Discuss the basic components of a marketing plan and their functions.</li><li>Create a marketing plan for a local agribusiness.</li></ol>
3. Explain agribusiness retailing. <sup>DOK2</sup>
4. Explain the sales process. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Categorize the types of agricultural sales methods.</li><li>Identify the steps in the sales process.</li><li>Describe various customer approaches.</li><li>Demonstrate effective sales principles and techniques.</li><li>Identify methods for overcoming customer resistance.</li><li>Identify specific business procedures used during sales transactions.</li></ol>
5. Identify various types of advertising involved in agriculture. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Explain how advertising is used in agribusiness.</li><li>Identify types of advertising media used by agribusinesses.</li><li>Discuss methods in identifying potential customers.</li><li>Develop a plan for an agricultural product or service.</li><li>Design and prepare an agribusiness display and advertisement.</li><li>Demonstrate how to implement a marketing plan to advertise products and services.</li></ol>



# Unit 11: Management and Administration of Agribusiness

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<b>Competencies and Suggested Objectives</b>	
1. Discuss and utilize the principles of business management. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Examine the principles of business management.<ul style="list-style-type: none"><li>• Strategic planning and management</li><li>• Tactical planning</li><li>• Operational planning</li><li>• Succession planning</li></ul></li><li>b. Discuss the function of agribusiness management and its impact on risk and cultural environments.</li><li>c. Examine the concept of diversity and cultural differences as related to management.</li><li>d. Examine principles of conflict resolution as related to management.</li></ol>
2. Manage a school-based business venture. <sup>DOK3</sup>	
3. Apply principles of business ethics. <sup>DOK3</sup>	<ol style="list-style-type: none"><li>a. Define ethics.</li><li>b. Discuss issues of business ethics.</li><li>c. Explain social responsibilities of businesses.</li><li>d. Demonstrate skills of making ethical decisions.</li></ol>
4. Explore human resources management. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Describe the six considerations that employers need to make before hiring individuals.</li><li>b. Describe the characteristics a good manager should possess when working with employees.</li><li>c. Identify methods for motivating employees.</li><li>d. Identify six considerations for employee evaluations.</li><li>e. Discuss laws that affect human resources management.</li></ol>

# Student Competency Profile

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**Student's Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Leadership and SAE for All</b>		
	1.	Participate in local, state, and/or national FFA activities that provide opportunities for leadership development and career exploration.
	2.	Identify potential college and career opportunities in agribusiness.
	3.	Review the types of programs under SAE for All.
	4.	Review individual plans for student Foundational SAE programs.
	5.	Develop an Immersion SAE and maintain agricultural records.
<b>Unit 2: Principles of Agribusiness and Entrepreneurship</b>		
	1.	Describe various types of agribusinesses.
	2.	Explore the concept and principles of entrepreneurship.
	3.	Identify and explain the scope and importance of agribusiness.
<b>Unit 3: Financial Management in Agribusiness</b>		
	1.	Describe the characteristics and functions of various financial institutions.
	2.	Explore banking services for personal and business accounts.
	3.	Explore concepts of credit.
	4.	Compare loan options.
	5.	Investigate the various types of investment opportunities.
<b>Unit 4: Examine Financial Performance</b>		
	1.	Describe basic record-keeping principles.
	2.	Maintain records of income and expenses.
	3.	Apply basic inventory principles.
	4.	Examine a balance sheet (i.e., net worth statement).
	5.	Examine an income statement.
	6.	Examine a statement of cash flow.

<b>Unit 5: Taxes and Legal Concepts</b>		
	1.	Manage personal income taxes.
	2.	Manage business taxes.
	3.	Describe common legal issues and documents and their applications.
	4.	Describe safety and health regulations related to agribusinesses.
<b>Unit 6: Agricultural Economics</b>		
	1.	Distinguish among basic economic principles in agribusiness.
	2.	Explain an agribusiness enterprise.
	3.	Apply economic principles as they relate to business management.
<b>Unit 7: Risk Management in Agribusiness</b>		
	1.	Assess financial risk factors in agribusiness management.
	2.	Discuss the risks associated with capital resources in agribusiness.
	3.	Evaluate production risks associated with agribusiness management.
<b>Unit 8: Implementing, Planning, and Decision-Making Procedures Through Budgeting</b>		
	1.	Construct specific, measurable, attainable, realistic, and timely (SMART) goals for an agribusiness.
	2.	Examine the importance of personal budgeting.
	3.	Discuss and demonstrate budgeting in an agribusiness.
	4.	Utilize a budget in the decision-making process.
<b>Unit 9: Establishing an Agribusiness</b>		
	1.	Develop a concept for an agribusiness.
	2.	Prepare a business plan for the agribusiness.
	3.	Evaluate a business plan for an agricultural enterprise.
<b>Unit 10: Agribusiness Marketing and Sales</b>		
	1.	Explain agribusiness marketing.
	2.	Develop a basic marketing plan for a local business.
	3.	Explain agribusiness retailing.
	4.	Explain the sales process.
	5.	Identify various types of advertising involved in agriculture.
<b>Unit 11: Management and Administration of Agribusiness</b>		
	1.	Discuss and utilize the principles of business management.
	2.	Manage a school-based business venture.
	3.	Apply principles of business ethics.
	4.	Explore human resources management.

## Appendix: Industry Standards

### Framework for AFNR Content Standards and Performance Elements Crosswalk for Diversified Agriculture Agribusiness Core

	Unit	1	2	3	4	5	6	7	8	9	10	11
AFNR												
ABS- Agribusiness Systems		X	X	X	X	X	X	X	X	X	X	X
AS- Animal Systems												
BS- Biotechnology												
CRP- Career Ready Practices		X	X	X	X	X	X	X	X	X	X	X
CS- AFNR Cluster Skill		X	X	X	X	X	X	X	X	X	X	X
ES- Environmental Service Systems												
FPP- Food Products and Processing Systems												
NRS- Natural Resource Systems												
PS- Plant Systems												
PST- Power, Structural, and Technical Systems												

### AFNR Pathway Content Standards and Performance Elements

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- ABS AGRIBUSINESS SYSTEMS**
- AS ANIMAL SYSTEMS**
- BS BIOTECHNOLOGY**
- CRP CAREER READY PRACTICES**
- CS AGRICULTURE FOOD AND NATURAL RESOURCES CLUSTER SKILL**
- ES ENVIRONMENTAL SERVICE SYSTEMS**
- FPP FOOD PRODUCTS AND PROCESSING SYSTEMS**
- NRS NATURAL RESOURCE SYSTEMS**
- PS PLANT SYSTEMS**
- PST POWER, STRUCTURAL, AND TECHNICAL SYSTEMS**

## Agribusiness Systems Career Pathway Content Standards

The Agribusiness Systems (ABS) Career Pathway encompasses the study of agribusinesses and their management including, but not limited to, record keeping, budget management (cash and credit), and business planning, and sales and marketing. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the planning, development, application and management of agribusiness systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agribusiness Systems (AG-ABS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ABS.01. CCTC Standard:** Apply management planning principles in AFNR businesses.

**ABS.01.01. Performance Indicator:** Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.

**ABS.01.02. Performance Indicator:** Read, interpret, evaluate and write statements of purpose to guide business goals, objectives and resource allocation.

**ABS.01.03. Performance Indicator:** Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.

**ABS.01.04. Performance Indicator:** Evaluate, develop and implement procedures used to recruit, train and retain productive human resources for AFNR businesses.

**ABS.02. CCTC Standard:** Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

**ABS.02.01. Performance Indicator:** Apply fundamental accounting principles, systems, tools and applicable laws and regulations to record, track and audit AFNR business transactions (e.g., accounts, debits, credits, assets, liabilities, equity, etc.).

**ABS.02.02. Performance Indicator:** Assemble, interpret and analyze financial information and reports to monitor AFNR business performance and support decision-making (e.g., income statements, balance sheets, cash-flow analysis, inventory reports, break-even analysis, return on investment, taxes, etc.).

**ABS.03. CCTC Standard:** Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.

**ABS.03.01. Performance Indicator:** Develop, assess and manage cash budgets to achieve AFNR business goals.

**ABS.03.02. Performance Indicator:** Analyze credit needs and manage credit budgets to achieve AFNR business goals.

**ABS.04. CCTC Standard:** Develop a business plan for an AFNR business.

**ABS.04.01. Performance Indicator:** Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.

**ABS.04.02. Performance Indicator:** Develop production and operational plans for an AFNR business.

**ABS.04.03. Performance Indicator:** Identify and apply strategies to manage or mitigate risk.

**ABS.05. CCTC Standard:** Use sales and marketing principles to accomplish AFNR business objectives.

**ABS.05.01. Performance Indicator:** Analyze the role of markets, trade, competition and price in relation to an AFNR business sales and marketing plans.

**ABS.05.02. Performance Indicator:** Assess and apply sales principles and skills to accomplish AFNR business objectives.

**ABS.05.03. Performance Indicator:** Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

## Animal Systems Career Pathway Content Standards

The Animal Systems (AS) Career Pathway encompasses the study of animal systems, including content areas such as life processes, health, nutrition, genetics, and management and processing, as applied to small animals, aquaculture, exotic animals, livestock, dairy, horses and/or poultry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of animal systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Animal Systems (AG-AS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**AS.01. CCTC Standard:** Analyze historic and current trends impacting the animal systems industry.

**AS.01.01. Performance Indicator:** Evaluate the development and implications of animal origin, domestication and distribution on production practices and the environment.

**AS.01.02. Performance Indicator:** Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.

- AS.01.03. Performance Indicator:** Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.
- AS.02. CCTC Standard:** Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.
- AS.02.01. Performance Indicator:** Demonstrate management techniques that ensure animal welfare.
- AS.02.02. Performance Indicator:** Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).
- AS.03. CCTC Standard:** Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.
- AS.03.01. Performance Indicator:** Analyze the nutritional needs of animals.
- AS.03.02 Performance Indicator:** Analyze feed rations and assess if they meet the nutritional needs of animals.
- AS.03.03 Performance Indicator:** Utilize industry tools to make animal nutrition decisions.
- AS.04. CCTC Standard:** Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.
- AS.04.01. Performance Indicator:** Evaluate animals for breeding readiness and soundness.
- AS.04.02. Performance Indicator:** Apply scientific principles to select and care for breeding animals.
- AS.04.03 Performance Indicator:** Apply scientific principles to breed animals.
- AS.05. CCTC Standard:** Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.
- AS.05.01. Performance Indicator:** Design animal housing, equipment and handling facilities for the major systems of animal production.
- AS.05.02. Performance Indicator:** Comply with government regulations and safety standards for facilities used in animal production.
- AS.06. CCTC Standard:** Classify, evaluate and select animals based on anatomical and physiological characteristics.
- AS.06.01. Performance Indicator:** Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).
- AS.06.02. Performance Indicator:** Apply principles of comparative anatomy and physiology to uses within various animal systems.
- AS.06.03. Performance Indicator:** Select and train animals for specific purposes and maximum performance based on anatomy and physiology.
- AS.07. CCTC Standard:** Apply principles of effective animal health care.
- AS.07.01. Performance Indicator:** Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

**AS.07.02. Performance Indicator:** Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

**AS.08. CCTC Standard:** Analyze environmental factors associated with animal production.

**AS.08.01. Performance Indicator:** Design and implement methods to reduce the effects of animal production on the environment.

**AS.08.02. Performance Indicator:** Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

## **Common Career Technical Core Career Ready Practices Content Standards**

The CCTC CRPs encompass fundamental skills and practices that all students should acquire to be career ready such as: responsibility, productivity, healthy choices, maintaining personal finances, communication, decision-making, creativity and innovation, critical-thinking, problem solving, integrity, ethical leadership, management, career planning, technology use and cultural/global competency. Students completing a program of study in any AFNR career pathway will demonstrate the knowledge, skills and behaviors that are important to career ready through experiences in a variety of settings (e.g., classroom, CTSO, work-based learning, community etc.).

**DEFINITIONS:** Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for CRPs from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** –These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a CTE program of study.

**CRP.01. CCTC Standard:** Act as a responsible and contributing citizen and employee.

**CRP.01.01. Performance Indicator:** Model personal responsibility in the workplace and community.

**CRP.01.02 Performance Indicator:** Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.

**CRP.01.03. Performance Indicator:** Identify and act upon opportunities for professional and civic service at work and in the community.

**CRP.02. CCTC Standard:** Apply appropriate academic and technical skills.

**CRP.02.01. Performance Indicator:** Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.



**CRP.02.02. Performance Indicator:** Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

**CRP.03. CCTC Standard:** Attend to personal health and financial well-being.

**CRP.03.01. Performance Indicator:** Design and implement a personal wellness plan.

**CRP.03.02. Performance Indicator:** Design and implement a personal financial management plan.

**CRP.04. CCTC Standard:** Communicate clearly, effectively and with reason.

**CRP.04.01. Performance Indicator:** Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

**CRP.04.02. Performance Indicator:** Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

**CRP.04.03. Performance Indicator:** Model active listening strategies when interacting with others in formal and informal settings.

**CRP.05. CCTC Standard:** Consider the environmental, social and economic impacts of decisions.

**CRP.05.01. Performance Indicator:** Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.

**CRP.05.02. Performance Indicator:** Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

**CRP.06. CCTC Standard:** Demonstrate creativity and innovation.

**CRP.06.01. Performance Indicator:** Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

**CRP.06.02. Performance Indicator:** Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

**CRP.06.03. Performance Indicator:** Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

**CRP.07. CCTC Standard:** Employ valid and reliable research strategies.

**CRP.07.01. Performance Indicator:** Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

**CRP.07.02. Performance Indicator:** Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

**CRP.08. CCTC Standard:** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP.08.01. Performance Indicator:** Apply reason and logic to evaluate workplace and community situations from multiple perspectives.

**CRP.08.02. Performance Indicator:** Investigate, prioritize and select solutions to solve problems in the workplace and community.

**CRP.08.03. Performance Indicator:** Establish plans to solve workplace and community problems and execute them with resiliency.

**CRP.09. CCTC Standard:** Model integrity, ethical leadership and effective management.

**CRP.09.01. Performance Indicator:** Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

**CRP.09.02. Performance Indicator:** Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

**CRP.09.03. Performance Indicator:** Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community (e.g., positively influencing others, effectively communicating, etc.).

**CRP.10. CCTC Standard:** Plan education and career path aligned to personal goals.

**CRP.10.01. Performance Indicator:** Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

**CRP.10.02. Performance Indicator:** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

**CRP.10.03. Performance Indicator:** Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

**CRP.10.04. Performance Indicator:** Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

**CRP.11. CCTC Standard:** Use technology to enhance productivity.

**CRP.11.01. Performance Indicator:** Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

**CRP.11.02. Performance Indicator:** Evaluate personal and organizational risks of technology use and take actions to prevent or minimize risks in the workplace and community.

**CRP.12. CCTC Standard:** Work productively in teams while using cultural/global competence.

**CRP.12.01. Performance Indicator:** Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

**CRP.12.02. Performance Indicator:** Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

## **Agriculture, Food, and Natural Resources Cluster Skill Content Standards**

The AFNR Cluster Skills (CS) encompasses the study of fundamental knowledge and skills related to all AFNR professions. Students completing a program of study in any AFNR career

pathway will demonstrate fundamental knowledge of the nature, scope and relationships of AFNR systems and the skills necessary for analysis of current and historical issues and trends; application of technologies; safety, health and environmental practices; stewardship of natural resources; and exploration of career opportunities.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Agriculture, Food and Natural Resources Career Cluster® (AG) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**CS.01. CCTC Standard:** Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.

**CS.01.01. Performance Indicator:** Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

**CS.01.02. Performance Indicator:** Examine technologies and analyze their impact on AFNR systems.

**CS.01.03. Performance Indicator:** Identify public policies and examine their impact on AFNR systems.

**CS.02. CCTC Standard:** Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

**CS.02.01. Performance Indicator:** Research and use geographic and economic data to solve problems in AFNR systems.

**CS.02.02. Performance Indicator:** Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

**CS.03. CCTC Standard:** Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

**CS.03.01. Performance Indicator:** Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.

**CS.03.02. Performance Indicator:** Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

**CS.03.03. Performance Indicator:** Apply health and safety practices to AFNR workplaces.

**CS.03.04. Performance Indicator:** Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

**CS.04. CCTC Standard:** Demonstrate stewardship of natural resources in AFNR activities.

**CS.04.01. Performance Indicator:** Identify and implement practices to steward natural resources in different AFNR systems.

**CS.04.02. Performance Indicator:** Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.

**CS.05. CCTC Standard:** Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

**CS.05.01. Performance Indicator:** Evaluate and implement the steps and requirements to pursue a career opportunity in each of the AFNR career pathways (e.g., goals, degrees, certifications, resumes, cover letter, portfolios, interviews, etc.).

**CS.06. CCTC Standard:** Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

**CS.06.01. Performance Indicator:** Examine and explain foundational cycles and systems of AFNR.

**CS.06.02. Performance Indicator:** Analyze and explain the connection and relationships between different AFNR systems on a national and global level.

## **Biotechnology Systems Career Pathway Content Standards**

The Biotechnology Systems (BS) Career Pathway encompasses the study of using data and scientific techniques to solve problems concerning living organisms with an emphasis on applications to agriculture, food and natural resource systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of biotechnology in the context of AFNR.

Within each pathway, the standards are organized as follows:

- **National Council for Agricultural Education (NCAE) Standard\*** – These are the standards set forth by the National Council for Agricultural Education for Biotechnology Systems. They define what students should know and be able to do after completing instruction in a program of study focused on applying biotechnology to AFNR systems.
- **Performance Indicators** – These statements distill each performance element into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related performance element at the conclusion of a program of study in this area.

**BS.01. NCAE Standard:** Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).

**BS.01.01. Performance Indicator:** Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).

**BS.01.02. Performance Indicator:** Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).

**BS.01.03. Performance Indicator:** Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).

**BS.02. NCAE Standard:** Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

**BS.02.01. Performance Indicator:** Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.

**BS.02.02. Performance Indicator:** Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.

**BS.02.03. Performance Indicator:** Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.

**BS.02.04. Performance Indicator:** Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

**BS.02.05. Performance Indicator:** Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

**BS.03. NCAE Standard:** Demonstrate the application of biotechnology to solve problems in Agriculture, Food and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

**BS.03.01. Performance Indicator:** Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

**BS.03.02. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

**BS.03.03. Performance Indicator:** Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).

**BS.03.04. Performance Indicator:** Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

**BS.03.05. Performance Indicator:** Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).

**BS.03.06. Performance Indicator:** Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

## Environmental Service Systems Career Pathway Content Standards

The Environmental Service Systems (ESS) Career Pathway encompasses the study of systems, instruments and technology used to monitor and minimize the impact of human activity on environmental systems. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of environmental service systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Environmental Service Systems (AG-ESS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**ESS.01. CCTC Standard:** Use analytical procedures and instruments to manage environmental service systems.

**ESS.01.01. Performance Indicator:** Analyze and interpret laboratory and field samples in environmental service systems.

**ESS.01.02. Performance Indicator:** Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).

**ESS.02. CCTC Standard:** Evaluate the impact of public policies and regulations on environmental service system operations.

**ESS.02.01. Performance Indicator:** Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.

**ESS.02.02. Performance Indicator:** Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).

**ESS.02.03. Performance Indicator:** Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

**ESS.03. CCTC Standard:** Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

**ESS.03.01. Performance Indicator:** Apply meteorology principles to environmental service systems.

**ESS.03.02. Performance Indicator:** Apply soil science and hydrology principles to environmental service systems.

**ESS.03.03. Performance Indicator:** Apply chemistry principles to environmental service systems.

**ESS.03.04. Performance Indicator:** Apply microbiology principles to environmental service systems.

**ESS.03.05. Performance Indicator:** Apply ecology principles to environmental service systems.

**ESS.04. CCTC Standard:** Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

**ESS.04.01. Performance Indicator:** Use pollution control measures to maintain a safe facility and environment.

**ESS.04.02. Performance Indicator:** Manage safe disposal of all categories of solid waste in environmental service systems.

**ESS.04.03. Performance Indicator:** Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

**ESS.04.04. Performance Indicator:** Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.

**ESS.05. CCTC Standard:** Use tools, equipment, machinery and technology common to tasks in environmental service systems.

**ESS.05.01. Performance Indicator:** Use technological and mathematical tools to map land, facilities and infrastructure for environmental service systems.

**ESS.05.02. Performance Indicator:** Perform assessments of environmental conditions using equipment, machinery and technology.

## **Food Products and Processing Systems Career Pathway Content Standards**

The Food Products and Processing Systems (FPP) Career Pathway encompasses the study of food safety and sanitation; nutrition, biology, microbiology, chemistry and human behavior in local and global food systems; food selection and processing for storage, distribution and consumption; and the historical and current development of the food industry. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of food products and processing systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- ***Common Career Technical Core (CCTC) Standards*** – These are the standards for Food Products and Processing Systems (AG-FPP) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- ***Performance Indicators*** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to

demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**FPP.01. CCTC Standard:** Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

**FPP.01.01. Performance Indicator:** Analyze and manage operational and safety procedures in food products and processing facilities.

**FPP.01.02. Performance Indicator:** Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

**FPP.01.03. Performance Indicator:** Apply food safety procedures when storing food products to ensure food quality.

**FPP.02. CCTC Standard:** Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

**FPP.02.01. Performance Indicator:** Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.02. Performance Indicator:** Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.02.03. Performance Indicator:** Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

**FPP.03. CCTC Standard:** Select and process food products for storage, distribution and consumption.

**FPP.03.01. Performance Indicator:** Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

**FPP.03.02. Performance Indicator:** Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

**FPP.03.03. Performance Indicator:** Create food distribution plans and procedures to ensure safe delivery of food products.

**FPP.04. CCTC Standard:** Explain the scope of the food industry and the historical and current developments of food product and processing.

**FPP.04.01. Performance Indicator:** Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

**FPP.04.02. Performance Indicator:** Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

**FPP.04.03. Performance Indicator:** Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

## Natural Resource Systems Career Pathway Content Standards



The Natural Resource Systems (NRS) Career Pathway encompasses the study of the management, protection, enhancement and improvement of soil, water, wildlife, forests and air as natural resources. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of natural resource systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Natural Resource Systems (AG-NRS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**NRS.01. CCTC Standard:** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

**NRS.01.01. Performance Indicator:** Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.

**NRS.01.02. Performance Indicator:** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.

**NRS.01.03. Performance Indicator:** Apply ecological concepts and principles to atmospheric natural resource systems.

**NRS.01.04. Performance Indicator:** Apply ecological concepts and principles to aquatic natural resource systems.

**NRS.01.05. Performance Indicator:** Apply ecological concepts and principles to terrestrial natural resource systems.

**NRS.01.06. Performance Indicator:** Apply ecological concepts and principles to living organisms in natural resource systems.

**NRS.02. CCTC Standard:** Analyze the interrelationships between natural resources and humans.

**NRS.02.01. Performance Indicator:** Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).

**NRS.02.02. Performance Indicator:** Assess the impact of human activities on the availability of natural resources.

**NRS.02.03. Performance Indicator:** Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.

**NRS.02.04. Performance Indicator:** Examine and explain how economics affects the use of natural resources.

**NRS.02.05. Performance Indicator:** Communicate information to the public regarding topics related to the management, protection, enhancement, and improvement of natural resources.

**NRS.03. CCTC Standard:** Develop plans to ensure sustainable production and processing of natural resources.

**NRS.03.01. Performance Indicator:** Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).

**NRS.03.02. Performance Indicator:** Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

**NRS.04. CCTC Standard:** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

**NRS.04.01. Performance Indicator:** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

**NRS.04.02. Performance Indicator:** Diagnose plant and wildlife diseases and follow protocols to prevent their spread.

**NRS.04.03. Performance Indicator:** Prevent or manage introduction of ecologically harmful species in a particular region.

**NRS.04.04. Performance Indicator:** Manage fires in natural resource systems.

## Plant Science Systems Career Pathway Content Standards

The Plant Systems (PS) Career Pathway encompasses the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices through the study of crops, turf grass, trees, shrubs and/or ornamental plants. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of plant systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Plant Systems (AG-PS) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

- PS.01. CCTC Standard:** Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- PS.01.01. Performance Indicator:** Determine the influence of environmental factors on plant growth.
- PS.01.02. Performance Indicator:** Prepare and manage growing media for use in plant systems.
- PS.01.03. Performance Indicator:** Develop and implement a fertilization plan for specific plants or crops.
- PS.02. CCTC Standard:** Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.01. Performance Indicator:** Classify plants according to taxonomic systems.
- PS.02.02. Performance Indicator:** Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Performance Indicator:** Apply knowledge of plant physiology and energy conversion to plant systems.
- PS.03. CCTC Standard:** Propagate, culture and harvest plants and plant products based on current industry standards.
- PS.03.01. Performance Indicator:** Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Performance Indicator:** Develop and implement a management plan for plant production.
- PS.03.03. Performance Indicator:** Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Performance Indicator:** Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Performance Indicator:** Harvest, handle and store crops according to current industry standards.
- PS.04. CCTC Standard:** Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- PS.04.01. Performance Indicator:** Evaluating, identifying and preparing plants to enhance an environment.
- PS.04.02. Performance Indicator:** Create designs using plants.

## Power, Structural and Technical Systems Career Pathway Content Standards

The Power, Structural and Technical Systems (PST) Career Pathway encompasses the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures. Students completing a program of study in this pathway will demonstrate competence in the application of principles and techniques for the development, application and management of power, structural and technical systems in AFNR settings.

Within each pathway, the standards are organized as follows:

- **Common Career Technical Core (CCTC) Standards** – These are the standards for Power, Structural and Technical Systems (AG-PST) from the 2012 version of the Common Career and Technical Core Standards, which are owned by the National Association of State Directors of Career and Technical Education/National Career Technical Education Foundation and are used here with permission. These statements define what students should know and be able to do after completing instruction in a program of study for this pathway.
- **Performance Indicators** – These statements distill each CCTC Standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related CCTC Standard at the conclusion of a program of study in this area.

**PST.01. CCTC Standard:** Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.

**PST.01.01. Performance Indicator:** Apply physical science and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.

**PST.01.02. Performance Indicator:** Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.

**PST.01.03. Performance Indicator:** Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g., SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch, etc.).

**PST.02. CCTC Standard:** Operate and maintain AFNR mechanical equipment and power systems.

**PST.02.01. Performance Indicator:** Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.

**PST.02.02. Performance Indicator:** Operate machinery and equipment while observing all safety precautions in AFNR settings.

**PST.03. CCTC Standard:** Service and repair AFNR mechanical equipment and power systems.

**PST.03.01. Performance Indicator:** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.

**PST.03.02. Performance Indicator:** Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.

**PST.03.03. Performance Indicator:** Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

**PST.04. CCTC Standard:** Plan, build and maintain AFNR structures.

**PST.04.01. Performance Indicator:** Create sketches and plans for AFNR structures.

**PST.04.02. Performance Indicator:** Determine structural requirements, specifications and estimate costs for AFNR structures

**PST.04.03. Performance Indicator:** Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).

**PST.04.04. Performance Indicator:** Apply electrical wiring principles in AFNR structures.

**PST.05. CCTC Standard:** Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.

**PST.05.01. Performance Indicator:** Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.

**PST.05.02. Performance Indicator:** Prepare and/or use electrical drawings to design, install and troubleshoot electronic control systems in AFNR settings.

**PST.05.03. Performance Indicator:** Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.





## 2022 Early Childhood Education

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The Research and Curriculum Unit (RCU) located in Starkville, MS, as part of Mississippi State University, was established to foster educational enhancements and innovations. In keeping with the land grant mission of Mississippi State University, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendices. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE ECE curriculum is aligned to the following standards:

## **National Association for the Education of Young Children (NAEYC)**

The National Association for the Education of Young Children (NAEYC) is the world's largest organization working on behalf of young children. NAEYC believes all young children thrive and learn in a society dedicated to ensuring they reach their full potential. NAEYC promotes high-quality early learning for all children, birth through age 8, by connecting practice, policy, and research. NAEYC is dedicated to improving the well-being of all young children, with particular focus on the quality of educational and developmental services for all children from birth through age 8. NAEYC is committed to becoming an increasingly high performing and inclusive organization. Since 1985, NAEYC has offered a national, voluntary accreditation system to set professional standards for early childhood education programs and to help families identify high-quality programs. Today, NAEYC accreditation represents the mark of quality in early childhood education. Over 6,500 child-care programs, preschools, early learning centers, and other center or school-based early childhood education programs are currently NAEYC-accredited. These programs provide high-quality care and education to nearly one million young children in the United States, its territories, and programs affiliated with the United States Department of Defense.

[naeyc.org](http://naeyc.org)

## **Child Development Associate (CDA) credential**

The Child Development Associate credential (CDA)™ is the unique credentialing process, administered by the Council for Professional Recognition, which results in the award of the CDA Credential. The program uses a specific set of time-tested, research-based tools that follow the CDA Competency Standards to determine early childhood teacher competency, based on multiple sources of evidence. The CDA Competency Standards are the core of the CDA program. Candidates seeking to earn the CDA Credential are assessed based upon the CDA Competency Standards.

[cdacouncil.org](http://cdacouncil.org)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

## Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## **Pathway Description**

Early childhood education is a pathway in the human science career cluster. It is a two-year high school program designed to include classroom and hands-on experiences to prepare students for employment or continuing education in the early childhood education field. In the course of study, emphasis is placed on students' personal and professional preparation for careers or education in the field, history and trends of early childhood education, children's health and safety, child development, and child guidance and observation. Emphasis is also placed on career and professional development, characteristics of high-quality early childhood centers, management and administration in quality childcare programs, and the learning environment. Instructional strategies and activities implemented through the course of study are aligned to the NAEYC and CDA standards and assist students in meeting requirements for the CDA credential.

## **College, Career, and Certifications**

Industry standards in the early childhood education curriculum are based on the NAEYC and CDA standards. NAEYC has set forth early childhood program standards, which are seamlessly integrated throughout the early childhood education curriculum. The NAEYC standards are nationally recognized and embraced by all stakeholders in the early childhood community. NAEYC, which is the largest organization in the early childhood field, also offers a prestigious certification for child-care centers and associate degree programs.

The CDA standards are also integrated into the curriculum. The CDA credential is a national credential that is awarded to quality caregivers who work with children from birth to age five years. In order to attain the CDA credential, an applicant must complete 480 hours of field experience, complete 120 hours of education coursework, and have a high school diploma or be enrolled in a high school career and technical program. After graduating from high school and gaining 120 hours of formal training, students have completed step one of the CDA credentialing process and may apply for the certification. CDA's standards are widely recognized by secondary and postsecondary early childhood technical programs, child-care centers, and the United States Department of Education. The CDA standards provide a mechanism for high school graduates to enter the workforce, with or without postsecondary training, to become highly qualified in the field of early childhood education and services.

The curriculum also combines effective classroom instruction with hands-on training to prepare students completing the early childhood education program and graduating from high school to enter the workforce or continue education at a postsecondary institution. Students who choose to enter the workforce after graduation from high school could gain employment as child-care providers or as teacher assistants. Students who choose to attend a postsecondary institution may enter a child-care technical program. After completion of the postsecondary program, students may enter the workforce as child-care providers, teacher assistants, or preschool teachers; however, students may also choose to further their education at an institution of higher learning. These students can major in early childhood education, elementary education, or child development.

## **Grade Level and Class Size Recommendations**

It is recommended that students enter this program as a ninth or 10th grader. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 20 students is recommended for this course.

## **Student Prerequisites**

In order for students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
  2. C or higher in math (last course taken or the instructor can specify the level of math instruction needed)
  3. Instructor approval and TABE reading score (eighth grade or higher)
- or**
1. TABE reading score (eighth grade or higher)
  2. Instructor approval
- or**
1. Instructor approval

## **Assessment**

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## **Applied Academic Credit**

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

## **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

## **Professional Learning**

If you have specific questions about the content of any of training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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## Option 1—Four 1-Carnegie-Unit Courses

This curriculum consists of four 1-credit courses, which should be completed in the following sequence:

1. **Fundamentals of Early Childhood Education—Course Code: 996202**
2. **Child Development—Course Code: 996203**
3. **The Learning Environment—Course Code: 996204**
4. **Management of a Quality Child Care Program—Course Code: 996205**

### **Course Description: Fundamentals of Early Childhood Education**

This course is an introduction to personal and professional preparation for a career in the field of early childhood education. Students are introduced to guidelines and regulations governing childcare facilities. Students will learn the components of child development for infant to three-year-old children. Participation in a student organization, field experiences, internships, and job-shadowing will be introduced in this course. Students will begin to develop skills and maintain documentation toward meeting requirements for the CDA credential.

### **Course Description: Child Development**

The course continues with child development, but focusing on children four years of age and those with special needs. Other topics covered include using developmentally appropriate knowledge to design policies that promote the health and safety of children in a childcare facility. Students will continue exposure to field experiences, such as internships and job-shadowing, as well as develop skills and maintain documentation toward meeting requirements for the CDA credential.

### **Course Description: The Learning Environment**

This course continues to emphasize knowledge in the areas of educational, career, and professional plans for the field of early childhood. The major topic of this course includes curriculum planning and scheduling in an early childhood program. Students will develop age-appropriate activities and create lesson plans that encompass all areas of child development. Methods of child guidance techniques are also introduced in this course. Students will participate in field experiences, internships, and job-shadowing on a more in-depth level. Students will continue to develop skills and maintain documentation toward meeting requirements for the CDA credential.

### **Course Description: Management of a Quality Child Care Program**

This course includes methods and strategies that enhance the quality of a childcare program as it relates to parental and community involvement. Cultural diversity will be a major topic for this course. Students will develop skills to promote cultural awareness and inclusiveness in a program. Participation in field experience, internships, and job-shadowing will continue on the most in-depth level. Students will also continue to develop skills and documentation toward meeting requirements for the CDA credential.



**Fundamentals of Early Childhood Education—Course Code: 996202**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
1	Program Orientation	40
2	Child Development: Infant to Three Years Old	100
<b>Total</b>		<b>140</b>

**Child Development—Course Code: 996203**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
3	Child Development: Four Years Old and Special Needs Populations	90
4	Preparing a Healthy and Safe Environment	50
<b>Total</b>		<b>140</b>

**The Learning Environment—Course Code: 996204**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
5	The Learning Environment	70
6	Curriculum Development	70
<b>Total</b>		<b>140</b>

**Management of a Quality Child Care Program—Course Code: 996205**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
7	Family and Community Relationships	70
8	Career Development and Professionalism	70
<b>Total</b>		<b>140</b>

## Option 2—Two 2-Carnegie-Unit Courses

This curriculum consists of two 2-credit courses, which should be completed in the following sequence:

1. **Early Childhood I—Course Code: 996200**
2. **Early Childhood II—Course Code: 996201**

### Course Description: Early Childhood I

This year-long course begins with an introduction to personal and professional preparation for continued education, training, and careers in early childhood. Major topics of study in this course are stages of child development, ranging from birth through age five, and children’s health and safety. Students are introduced to guidelines and regulations governing childcare facilities. Other topics covered are related to the importance of observing and assessing children. Methods of child guidance techniques are also introduced in this course. Participation in a student organization is ongoing. Students will participate in field experiences, internships, and job-shadowing, as well as develop skills and maintain documentation toward meeting requirements for the CDA credential.

### Course Description: Early Childhood II

This course focuses on curriculum planning and the development of age-appropriate activities and lesson plans that encompass all areas of child development. Other major topics covered in this course are methods of child guidance techniques and strategies to enhance the quality of a facility such as cultural diversity, parental, and community involvement. Students will continue to develop educational, career, and professional plans in the area of early childhood. Participation in a student organization is ongoing. Students will participate in field experiences, internships, and job-shadowing, as well as continue to develop skills and maintain documentation toward meeting requirements for the CDA credential.

### Early Childhood I—Course Code: 996200

Unit	Unit Name	Hours
1	Program Orientation	40
2	Child Development: Infant to Three Years Old	100
3	Child Development: Four Year Olds and Special Needs Populations	90
4	Preparing a Healthy and Safe Environment	50
<b>Total</b>		<b>280</b>

### Early Childhood II—Course Code: 996201

Unit	Unit Name	Hours
5	The Learning Environment	70
6	Curriculum Development	70
7	Family and Community Relationships	70
8	Career Development and Professionalism	70
<b>Total</b>		<b>280</b>

# Career Pathway Outlook

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## Overview

Quality ECE programs benefit our future society and economy. Research shows that preschool education is a sound economic investment, due to the fact that every dollar invested in early education saves taxpayers costs in the future. It is an investment that pays great returns. The ECE curriculum prepares students for future success in the field of early childhood education by improving academic and technology skills, improving employability skills, and articulating courses to community colleges. The rigorous and relevant two-year program is based on state and national standards, CDA competency standards, NAEYC standards, and 21st-century workforce skills. The course is a two-year or four-year program offering four Carnegie units of credit.

The industry of ECE is preparing for changes due to high rates of teacher retirement, national and state initiatives, requirements, and increasing focus on the field of early childhood education. The course allows core academic subjects that are vital to students' success to be integrated into the curriculum.

## Needs of the Future Workforce

Data for this synopsis were compiled from the Mississippi Department of Employment Security (2021). Employment opportunities for each of the occupations listed below are:

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earning
Preschool Teachers, Except Special Education	2,340	2,470	130	5.6	\$14.86
Kindergarten Teachers, Except Special Education	1,120	1,210	90	8.0	N/A
Elementary School Teachers, Except Special Education	15,060	16,280	1,220	8.1	N/A
Child Care Workers	8,660	8,890	230	2.7	\$9.29
Teacher Assistants	11,490	12,420	930	8.1	N/A

Source: Mississippi Department of Employment Security; [www.mdes.ms.gov](http://www.mdes.ms.gov) (2021).

## Perkins V Requirements and Academic Infusion

The ECE curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in the ECE fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for ECE careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

## **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board (MCCB) website, [mccb.edu](http://mccb.edu).

### **Best Practices**

#### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The ECE educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

#### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' backgrounds, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

#### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the ECE curriculum. FCCLA (Family, Career, and Community Leaders of America) and Skills USA are examples of student organizations for ECE. Student organizations provide participants and members with growth opportunities and competitive opportunities.

#### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the ECE curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The ECE curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the ECE curriculum that will allow and encourage collaboration with professionals currently in the field of ECE.

#### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the ECE classroom. The second year ECE program requires students to obtain a minimum of 100 clinical-type hours, which should include, but is not limited to, field trips, observations, job-shadowing, and preferably some sort of volunteer, internship, or apprenticeship experience. These real-world connections and applications provide a link to all types of students regarding knowledge, skills, and professional dispositions. Thus, supervised collaboration and immersion into the ECE world around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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American Library Association

[ala.org](http://ala.org)

Association of Career and Technical Education (ACTE)

[acteonline.org](http://acteonline.org)

Association for Childhood Education International

[ceinternational1892.org](http://ceinternational1892.org)

Association for Education Communications and Technology

[aect.org](http://aect.org)

Association for Experimental Education

[aee.org](http://aee.org)

Association for Supervision and Curriculum Development

[ascd.org](http://ascd.org)

Council for Exceptional Children

[cec.sped.org](http://cec.sped.org)

Council for Learning Disabilities

[cldinternational.org](http://cldinternational.org)

Council for Professional Recognition, Child Development Associate (CDA) Credential

[cdacouncil.org/about/cda-credential](http://cdacouncil.org/about/cda-credential)

Early Childhood Care and Development, Mississippi Department of Human Services

[mdhs.state.ms.us/early-childhood-care-development/](http://mdhs.state.ms.us/early-childhood-care-development/)

International Literacy Association

[literacyworldwide.org](http://literacyworldwide.org)

International Society for Technology in Education

[iste.org](http://iste.org)

Learning Disabilities Association of America

[ldaamerica.org](http://ldaamerica.org)

Mississippi Building Blocks

[zerotothree.org](http://zerotothree.org)

Mississippi Day Care Listings

[daycare.com](http://daycare.com)

Mississippi Office of Healthy Schools  
[healthyschoolsms.org/](http://healthyschoolsms.org/)

Mississippi State Department of Health  
Child Care Facilities Licensure  
[msdh.state.ms.us](http://msdh.state.ms.us)

National Art Education Association  
[arteducators.org](http://arteducators.org)

National Association for Bilingual Education  
[nabe.org](http://nabe.org)

National Association for Gifted Children  
[nagc.org](http://nagc.org)

National Association for the Education of Young Children  
[naeyc.org](http://naeyc.org)

National Science Teachers Association  
[nsta.org](http://nsta.org)

Southern Early Childhood Association  
[southernearlychildhood.org](http://southernearlychildhood.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the ECE program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the ECE program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Program Orientation

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## Competencies and Suggested Objectives

1. Describe the expectations, procedures, and opportunities in the early childhood education (ECE) program. <sup>DOK1</sup>
  - a. Review the curriculum standards, competencies, and objectives.
  - b. Discuss school and classroom policies for emergency procedures and the proper use of lab equipment.
  - c. Identify leadership opportunities in student organizations, such as FCCLA, Skills USA, or Educators Rising.
  - d. Complete federally required safety test with 100% accuracy.
2. Explore the opportunities and trends in the field of ECE. <sup>DOK2</sup>
  - a. Research the education and training required in the various ECE careers.
  - b. Identify characteristics and responsibilities of individuals working in the field.
  - c. Describe the various types of early childcare programs and the historical changes that have affected the field of ECE.
  - d. Investigate ECE organizations and their role in the field including licensing, regulations, and accreditations.
    - American Montessori Association (AMA)
    - Family, Career and Community Leaders of America (FCCLA)
    - National Association of Child Care Professionals (NACCP)
    - National Association for the Education of Young Children (NAEYC)
    - National Association for Family Child Care (NAFCC)
    - National Child Care Association (NCCA)
    - National Head Start Association (NHSA)
    - Child Development Association (CDA)

## Enrichment

1. Students should obtain a copy of the CDA National Credentialing Program and Competency Standards guidebook to review the High School Child Development Associate Credentialing process. See the ECE teacher resource guide for fundraising options to purchase the book (GoFundMe, etc.).
2. Prepare a professional portfolio to include their philosophy of early childhood education, résumé, and work samples that are created throughout the program.

**Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before participating in clinicals. This test should be documented in each student's file.

**Note:** Time allotted for this unit will be distributed over the entire year.



## Unit 2: Child Development: Infant to Three Years Old

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### Competencies and Suggested Objectives

1. Apply methods to observe and assess children's developmental and educational goals. <sup>DOK2</sup>
  - a. Identify the general purpose of assessments and factors that determine when they are conducted in a childcare setting.
  - b. Analyze factors involved in choosing assessments, including the advantages and disadvantages of each tool.
    - Checklist
    - Anecdotal records
    - Rating scales
    - Participation charts
    - Work samples/portfolios
    - Visual/technological
2. Analyze developmental stages and apply the appropriate strategies that promote growth in children from birth to two years of age. <sup>DOK3</sup>
  - a. Describe the characteristics associated with areas of development in children from birth to two years of age.
    - Physical
    - Cognitive
    - Social-emotional
  - b. Examine the behaviors and needs described by Erik Erikson's psychosocial theory that apply to the developmental stages for this group.
    - Stage I
    - Stage II
3. Analyze developmental stages and apply the appropriate strategies that promote growth in children from two to three years of age. <sup>DOK3</sup>
  - a. Describe the characteristics associated with areas of development in children from two to three years of age.
    - Physical
    - Cognitive
    - Social-emotional
  - b. Examine the stages of development for children in this age group according to theories and principles.
    - Piaget's theory of cognitive development
    - Erikson's psychosocial theory of human development

## Unit 3: Child Development: Four Years Old and Special Needs Populations

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### Competencies and Suggested Objectives

1. Analyze developmental stages and apply the appropriate strategies that promote growth in children from four to five years of age. <sup>DOK3</sup>
  - a. Describe the characteristics associated with areas of development for children in this age group.
    - Physical
    - Cognitive
    - Social-emotional
  - b. Examine the stages of development for children in this age group according to theoretical principles.
    - Piaget’s theory of cognitive development
    - Erikson’s psychosocial theory of human development
    - Maslow’s hierarchy of needs
2. Develop strategies that support the inclusion and development of children with special needs into a program. <sup>DOK3</sup>
  - a. Examine the purpose and goals of laws regarding disabilities in childcare programs.
    - Individuals with Disabilities Education Act (IDEA)
    - Individualized Education Plan (IEP)
    - Individualized Family Service Plan (IFSP)
    - Americans with Disabilities Act (ADA)
  - b. Apply strategies to identify and accommodate the various types of special needs.
    - Hearing
    - Speech/language
    - Visual
    - Physical
    - Cognitive/learning
    - Gifted

## Unit 4: Preparing a Healthy and Safe Environment

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### Competencies and Suggested Objectives

1. Demonstrate developmentally appropriate equipment selection and space organization skills to promote healthy learning environments. <sup>DOK3</sup>
  - a. Identify key elements and criteria involved in planning and preparing the environment.
    - Indoor environment
    - Indoor furniture and design
    - Activity areas
    - Outdoor environment
  - b. Plan activities and select equipment, materials, and toys that encourage the developmental skills of children, such as motor, problem solving, exploration, and communication.
    - Birth to two years of age
    - Two to three years of age
    - Three to four years of age
    - Special needs populations
2. Develop policies that must be implemented to protect the safety and health of children in a childcare facility. <sup>DOK3</sup>
  - a. Identify the necessary physical features to prevent or reduce injuries in a childcare facility.
    - Indoor and outdoor play areas
    - Furniture
    - Walls
    - Toys and equipment
  - b. Explain emergency and safety procedures that must be implemented to maintain a safe environment for children.
    - Child supervision
    - Transportation
    - Fire and weather
    - Choking and poisonings
  - c. Demonstrate procedures that minimize and prevent the spread of disease and infections.
    - Sanitizing and disinfecting
    - Hand washing
    - Diapering/toileting

- d. Identify concepts to design nutritious meals and snacks in a childcare program.
    - Common nutritional problems/needs
    - Food groups and sources
    - Meal plans and preferences
  - e. Design a center’s health policy that protects and improves the health of children.
    - Immunizations
    - Exclusion
    - Administering medications
    - Napping
    - Contacting parents
    - First aid
    - Wounds and burn treatment
3. Explain the legal requirements childcare centers use to promote children’s safety. <sup>DOK2</sup>
- a. Explore a center’s responsibility for ensuring the safety and health of children.
    - Types of liability
    - Health and safety forms
    - Privacy law
  - b. Recognize signs of neglect and abuse in children.
    - Nonaccidental physical injury
    - Neglect
    - Emotional abuse
    - Sexual abuse
  - c. Demonstrate procedures that minimize and prevent the spread of disease and infections.
    - Sanitizing and disinfecting
    - Hand washing
    - Diapering/toileting

- Enrichment**
- 1. Pursue a certification in first aid and infant or child CPR.
  - 2. Research the MSDH guidelines for a safe physical area, proper sanitation/hygiene, disease control and prevention practices, and immunization requirements.

# Unit 5: Learning Environment

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## Competencies and Suggested Objectives

1. Create a healthy, supportive, and challenging learning environment based on developmental skills of children. <sup>DOK3</sup>
  - a. Identify reasons and guidelines for establishing classroom limits and enforcement techniques.
  - b. Describe appropriate limitations for general classroom areas and activities.
    - Cooking
    - Sensory play
    - Playground activity
    - Dramatic play
    - Small manipulative activities
  - c. Identify strategies that promote effective routines and activities for early childhood education programs.
    - Arrival routines
    - Meals/snacks
    - Nap times
    - Indoor and outdoor play
    - Toileting and hand washing
  - d. Demonstrate the use of developmentally appropriate transition techniques that promote positive outcomes in a childcare setting.
2. Develop guidance skills to support developmental and educational goals. <sup>DOK2</sup>
  - a. Differentiate the purpose of discipline, guidance, and in a childcare setting.
  - b. Describe principles of direct and indirect guidance.
  - c. Identify the purpose and goals of techniques designed to guide children’s behavior.
    - Positive verbal environment
    - Positive reinforcement
    - Consequences
    - Warning
    - Time-out
    - I-messages
    - Praise
    - Prompting
    - Persuading
    - Redirecting
    - Modeling
    - Listening
    - Encouraging
    - Suggestions

## Enrichment

1. Select a local childcare facility to compare and contrast classroom design and layout, including office, classrooms, restrooms, isolation room, rest areas, security, lighting, toys and equipment, flooring, and wall and window treatments.
2. Design a developmentally appropriate classroom with basic areas.

# Unit 6: Curriculum Development

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## Competencies and Suggested Objectives

1. Demonstrate developmentally appropriate teaching methods and approaches to learning for early education. <sup>DOK2</sup>
  - a. Describe factors to consider, and the elements involved in the curriculum development process.
    - Program goals
    - Observations/assessments
    - Content vs. process-centered
    - Learning styles/interests
    - Themes
    - Resources
    - Activities
    - Technology
2. Demonstrate approaches to learning and teaching by incorporating developmentally appropriate themes. <sup>DOK2</sup>
  - a. Compile a list of developmentally appropriate themes for toddlers and preschool-age children.
  - b. Develop a web or flowchart illustrating a connection between activities and themed units of lessons.
  - c. Write a “block” format lesson plan based on a theme.
  - d. Create a “daily lesson plan” to include the following:
    - Goals
    - Motivation or introduction
    - Subject
    - Learning objectives
    - Procedures
    - Accommodations (developmental delays)
    - Materials
    - Closure/transition
    - Guided questions
    - Evaluation

3. Design a plan to guide learning experiences. <sup>DOK3</sup>
- a. In the plan, include the necessary elements for the following:
- Art
  - Language (storytelling, writing, play, or puppetry)
  - Math
  - Science
  - Social studies
  - Music or movement
  - Food experiences
  - Field trip experiences
  - Technology

## Unit 7: Family and Community Relationships

---

### Competencies and Suggested Objectives

1. Demonstrate cultural awareness and skills to build positive relationships with family and community members. <sup>DOK2</sup>
  - a. Identify the purpose and various methods for involving parents and families in the childcare program.
    - Parent-teacher conferences
    - Written communication
    - Home visits
    - Discussion groups
    - Volunteers
  - b. Identify strategies to promote cultural diversity and the dangers associated with certain concepts.
    - Multicultural books, toys, and materials
    - Celebrations, events, and holidays
    - Intergenerational concepts
    - Stereotypes
    - Nonsexist toys and materials
  - c. Identify strategies to promote cultural diversity and the dangers associated with certain concepts.
    - Cooking
    - Sensory play
    - Playground activity
    - Dramatic play
    - Small manipulative activities



## Unit 8: Career Development and Professionalism

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### Competencies and Suggested Objectives

1. Demonstrate career readiness and work-based learning skills. <sup>DOK3</sup>
  - a. Research and compare available jobs in the ECE field based on key factors.
    - Minimum education
    - Certifications
    - Minimum experience
    - Job description/responsibilities
    - Salary
  - b. Demonstrate basic interviewing skills led by the instructor and/or advisory committee members.
    - Professional attire
    - Cover letter
    - Application and/or résumé
    - Letters of recommendations
    - Thank you/follow up letters
  - c. Review individual professional portfolios to ensure necessary documents are included and information is current.
    - Philosophy of education
    - Lesson plans
    - Food menus and schedules
    - Daily schedule of activities
    - Observation records

### Enrichment

1. Obtain a copy of the Child Development Associate National Credentialing Program and CDA Competency Standards book to begin the preparation phase of the credentialing process.
2. Conduct mock interviews, in person or virtually (e.g., via Skype, Facetime, FlipGrid, etc.).

# Student Competency Profile

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**Student's Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Program Orientation and Introduction</b>		
	1.	Describe the expectations, procedures, and opportunities in the early childhood education (ECE) program.
	2.	Explore the opportunities and trends in the field of ECE.
<b>Unit 2: Child Development: Infant to Three Years Old</b>		
	1.	Apply methods to observe and assess children's developmental and educational goals.
	2.	Analyze developmental stages and apply the appropriate strategies that promote growth in children from birth to two years of age.
	3.	Analyze developmental stages and apply the appropriate strategies that promote growth in children from two to three years of age.
<b>Unit 3: Child Development: Four Years Old and Special Needs Populations</b>		
	1.	Analyze developmental stages and apply the appropriate strategies that promote growth in children from four to five years of age.
	2.	Develop strategies that support the inclusion and development of children with special needs into a program.
<b>Unit 4: Preparing a Healthy and Safe Environment</b>		
	1.	Demonstrate developmentally appropriate equipment selection and space organization skills to promote healthy learning environments.
	2.	Develop policies that must be implemented to protect the safety and health of children in a childcare facility.
	3.	Explain the legal requirements childcare centers use to promote children's safety.
<b>Unit 5: Learning Environment</b>		
	1.	Create a healthy, supportive, and challenging learning environment based on developmental skills of children.
	2.	Develop guidance skills to support developmental and educational goals.

<b>Unit 6: Curriculum Development</b>		
	1.	Demonstrate developmentally appropriate teaching methods and approaches to learning for early education.
	2.	Demonstrate approaches to learning and teaching by incorporating developmentally appropriate themes.
	3.	Design a plan to guide learning experiences.
<b>Unit 7: Family and Community Relationships</b>		
	1.	Demonstrate cultural awareness and skills to build positive relationships with family and community members.
<b>Unit 8: Career Development and Professionalism</b>		
	1.	Demonstrate career readiness and work-based learning skills.

## Appendix A: Unit References

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All of the early childhood education units use the same resources for each unit. You will find suggested resources listed below.

Council for Professional Recognition Child Development Associate Credential. (n.d.). [Web site]. Retrieved from [cdacouncil.org](http://cdacouncil.org)

Educators Rising. (n.d.). [Web site]. Retrieved from [educatorsrising.org](http://educatorsrising.org)

Environment Rating Scales Institute. (n.d.). [Web site]. Retrieved from [ersi.info/iters\\_notes.html](http://ersi.info/iters_notes.html)

Family, Career and Community Leaders of America. (n.d.). [Web site]. Retrieved from [fclainc.org](http://fclainc.org)

Herr, J. (2008). *Working with young children*. Tinley Park, IL: Goodheart-Wilcox.

Mississippi Department of Education. (n.d.). [Web site]. Retrieved from [mdek12.org/](http://mdek12.org/)

Mississippi State Department of Health. (n.d.). [Web site]. Retrieved from [mdhs.ms.gov](http://mdhs.ms.gov)

Mississippi Early Childhood Advocacy. (n.d.). [Web site]. Retrieved from [msearlychildhood.org](http://msearlychildhood.org)

Mississippi State University Research and Curriculum Unit. (n.d.). [Web site]. Retrieved from [rcu.msstate.edu](http://rcu.msstate.edu)

National Association for the Education of Young Children. (n.d.). [Web site]. Retrieved from [naeyc.org](http://naeyc.org)

Office of Head Start. (n.d.). [Web site]. Retrieved from [acf.hhs.gov/programs/ohs](http://acf.hhs.gov/programs/ohs)

SkillsUSA. (n.d.). [Web site]. Retrieved from [skillsusa.org](http://skillsusa.org)

U.S. Department of Education. (n.d.). Building the legacy: IDEA 2004. Retrieved from <http://idea.ed.gov>

U.S. Department of Education. (n.d.). Family Educational Rights and Privacy Act (FERPA). Retrieved from [ed.gov/policy/gen/guid/fpco/ferpa/index.html](http://ed.gov/policy/gen/guid/fpco/ferpa/index.html)

## Appendix B: Industry Standards

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### National Association for the Education of Young Children (NAEYC)

- NAEYC1 Promoting Child Development and Learning  
 NAEYC2 Building Family and Community Relationships  
 NAEYC3 Observing, Documenting, and Assessing  
 NAEYC4 Using Developmentally Effective Approaches to Connect with Children and Families  
 NAEYC5 Using Content Knowledge to Build Meaningful Curriculum  
 NAEYC6 Becoming a Professional

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
<b>Standard</b>									
NAEYC1		X	X	X	X	X		X	X
NAEYC2		X	X	X	X		X	X	X
NAEYC3		X	X	X		X		X	X
NAEYC4		X	X	X	X	X	X	X	X
NAEYC5		X	X	X	X	X	X	X	X
NAEYC6		X		X		X		X	X

### Child Development Associate credential (CDA)

- CDA1 To establish and maintain a safe, healthy learning environment  
 CDA2 To advance physical and intellectual competence  
 CDA3 To support social and emotional development and provide positive guidance  
 CDA4 To establish positive and productive relationships  
 CDA5 To ensure a well-run, purposeful program responsive to participant needs  
 CDA6 To maintain a commitment to professionalism

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
<b>Standard</b>									
CDA1		X	X		X	X	X	X	X
CDA2		X	X	X	X	X	X	X	X
CDA3			X	X	X	X		X	X
CDA4		X	X	X	X		X	X	X
CDA5		X		X	X	X		X	X
CDA6		X		X	X		X	X	





## 2022 Cosmetology

Program CIP: Program CIP: 12.0401—Cosmetology/Cosmetologist, General

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Mississippi State, MS 39762

The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendices. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE cosmetology curriculum is aligned to the following standards.

## **Mississippi State Board of Cosmetology (MSBC)**

The MSBC establishes rules and regulations that regulate the instruction and practice of cosmetology and related professions. The board sets licensure qualifications and procedures for the exam administration. Additionally, the board determines regulations setting forth sanitation requirements for the operation of cosmetology establishments, for the benefit of the consumer and for the public health.

[msbc.ms.gov/](http://msbc.ms.gov/)

## **National Skills Standards for Cosmetology**

*Milady Standard Textbook of Cosmetology*, 13th edition. (2016) Clifton Park, NY. Cengage.

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oea/college-and-career-readiness-standards](http://mdek12.org/oea/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019)

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

Cosmetology is a pathway in the human services career cluster. It is a two-year high school program that includes classroom and hands-on experiences for students who wish to care for hair, nails, and skin. Over the course of study, students will learn the theory and practice of hair, cosmetics, and nail design. Emphasis is also placed on career and professional development by focusing on salon operation and management.

Instructional strategies and activities implemented throughout the course of study are aligned to the (MSBC) standards and the Milady Standard Cosmetology. Cosmetology students will be required to obtain a minimum of 100 practical (clinical) hours over the course of the two-year program. Practical hours can consist of salon visits, hair shows, and techniques practiced and demonstrated in the classroom.

## College, Career, and Certifications

Students who successfully complete the program may choose to transfer the accumulated practical hours to a certified cosmetology school to complete the MSBC licensure process. In addition, students may choose to continue their education at a post-secondary institution. Students who choose to attend a postsecondary program, may enter a cosmetology technical program. After completion of the postsecondary program and becoming a licensed cosmetologist, students may enter the workforce as a salon stylist, nail, or skin technician. In addition, students will be able to pursue their own salon. Continuing education credits and training with the state board allow for advanced positions such as master stylists and instructor roles.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 15 students is recommended for this class that is both classroom- and lab-based.

## Student Prerequisites

In order for students to be able to experience success in the Cosmetology program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in Math (last course taken or the instructor can specify the math)
3. C or higher in specified science course approved by the instructor

**or**

1. Instructor Approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

### **Applied Academic Credit**

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

### **Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

### **Professional Learning**

If you have specific questions about the content of any training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

---

## Option 1—Four 1-Carnegie Unit Courses

This curriculum consists of four 1-credit courses that should be completed in the following sequence:

1. **Introduction to Cosmetology—Course Code: 994700**
2. **Basic Cosmetology—Course Code: 994701**
3. **Advanced Cosmetology—Course Code: 994701**
4. **Applications of Cosmetology—Course Code: 994703**

### **Course Description: Introduction to Cosmetology**

This course introduces students to the field of cosmetology and identifies some of the current and future trends affecting the cosmetology industry and the impact that this trade has on society and the global economy. Students will explore safety, infection control, and decontamination issues associated with cosmetology. This course will give students a detailed look at the histology of the skin before allowing students to study aspects of the human anatomy and physiology to understand their importance to cosmetology.

### **Course Description: Basic Cosmetology**

Students will be introduced to the properties of the hair and scalp. Additional science-related content will include the study of basic chemistry and electricity as it relates to cosmetology. Students will learn about the principles of hair design to understand basic techniques for styling. Then students will be introduced to scalp cleansing to understand the importance of techniques such as shampooing and conditioning.

### **Course Description: Advanced Cosmetology**

This course will begin to give students in-depth skills regarding theoretical and practical knowledge. Students will gain an understanding of haircutting, thermal styling, permanent waving, and chemical relaxing. Previous science and structural content will be reviewed in this course in order to refresh students' knowledge for application to relevant material. In addition, students will learn techniques for basic and classic hairstyles. This course will cover the more advanced principles of hair design including braiding and extensions, wigs, and other hair enhancements.

### **Course Description: Applications of Cosmetology**

In this course, students will gain an in depth understanding about hair coloring, facials and facial massage, makeup, and advanced nail techniques. Previous science and structural content will be reviewed in this course in order to refresh students' knowledge for application to relevant material. This course will conclude with a review of the business skills necessary to practice cosmetology.



**Introduction to Cosmetology—Course Code: 994700**

Unit	Unit Name	Hours
1	Program Orientation	20
2	Safety and Infection Control	50
3	Anatomy and Physiology	40
4	Introduction to Skin and Nail Care	30
<b>Total</b>		<b>140</b>

**Basic Cosmetology—Course Code: 994701**

Unit	Unit Name	Hours
5	Properties of the Hair and Scalp	60
6	Basic Chemistry and Electricity	30
7	Principles of Hair Design	20
8	Shampooing and Conditioning	30
<b>Total</b>		<b>140</b>

**Advanced Cosmetology—Course Code: 994702**

Unit	Unit Name	Hours
9	Haircutting	50
10	Hairstyling	20
11	Hair Braiding, Additions, and Enhancements	30
12	Chemical Texture Services	40
<b>Total</b>		<b>140</b>

**Applications of Cosmetology—Course Code: 994703**

Unit	Unit Name	Hours
13	Hair Coloring	40
14	Facials and Makeup	40
15	Nail Care Services	20
16	Professional Development	40
<b>Total</b>		<b>140</b>

## **Option 2—Two 2-Carnegie Unit Courses**

This curriculum consists of two 2-credit courses that should be completed in the following sequence:

- 1. Cosmetology I—Course Code: 994704**
- 2. Cosmetology II—Course Code: 994705**

### **Course Description: Cosmetology I**

This course introduces students to the field of cosmetology and identifies some of the current and future trends affecting the cosmetology industry and the impact that this trade has on society and the global economy. Students will explore safety, infection control, and decontamination issues associated with cosmetology. This course will give students a detailed look at the histology of the skin before allowing students to study aspects of the human anatomy and physiology to understand their importance to cosmetology. Students will be introduced to the properties of the hair and scalp. Additional science-related content will include the study of basic chemistry and electricity as it relates to cosmetology. Students will learn about the principles of hair design to understand basic techniques for styling. Then students will be introduced to scalp cleansing to understand the importance of techniques such as shampooing and conditioning.

### **Course Description: Cosmetology II**

This course will begin to give students in-depth skills regarding theoretical and practical knowledge. Students will gain an understanding of haircutting, thermal styling, permanent waving, and chemical relaxing. In addition, students will learn techniques for basic and classic hairstyles. This course will cover the more advanced principles of hair design including braiding and extensions, wigs, and other hair enhancements. In this course, students will gain an in depth understanding about hair coloring, facials and facial massage, makeup, and advanced nail techniques. Previous science and structural content will be reviewed in this course in order to refresh students' knowledge for application to relevant material. This course will conclude with a review of the business skills necessary to practice cosmetology.

**Cosmetology I—Course Code: 994704**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
1	Program Orientation	20
2	Safety and Infection Control	50
3	Anatomy and Physiology	40
4	Introduction to Skin and Nail Care	30
5	Properties of the Hair and Scalp	60
6	Basic Chemistry and Electricity	30
7	Principles of Hair Design	20
8	Shampooing and Conditioning	30
<b>Total</b>		<b>280</b>

**Cosmetology II—Course Code: 994705**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
9	Haircutting	50
10	Hairstyling	20
11	Hair Braiding, Additions, and Enhancements	30
12	Chemical Texture Services	40
13	Hair Coloring	40
14	Facials and Makeup	40
15	Nail Care Services	20
16	Professional Development	40
<b>Total</b>		<b>280</b>

# Career Pathway Outlook

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## Overview

This program is designed to provide classroom theory and practical application in tasks related to cosmetology. It prepares students for a variety of occupations in cosmetology including hairstylist, makeup artist, massage therapist, cosmetology teacher, barber, esthetician, electrologist, nail technician, hair color technician, or others. Course content provides coherent and rigorous alignment with challenging academic standards and relevant technical knowledge needed to prepare for further education and careers in various fields related to cosmetology.

## Needs of the Future Workforce

Mississippi classifies individuals in the cosmetology industry as personal appearance workers. Occupations within this classification include barbers, cosmetologists, nail technicians, and skincare specialists. This field is projected to grow by 6% in Mississippi. Nationwide, opportunities in this field are expected to be good overall despite a slight 1% decline for hairdressers. Future workers should expect strong competition from experienced workers in the field. Specialized services such as manicurists, pedicurists, and skincare specialists will continue to grow as consumers seek their services directly instead of from cosmetologists. Data for this synopsis was compiled from employment projections prepared by the Mississippi Department of Employment Security and the United States Department of Labor Statistics (2021).

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2021
Hairstylist and Cosmetologist	1,400	1,480	80	5.7%	\$15.32
Manicurist/Pedicurist	240	260	20	8.3%	\$14.25
Skincare Specialist	200	210	10	5%	\$15.75

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

## Perkins V Requirements

The cosmetology curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in the cosmetology fields. It also offers students a program of study including secondary, postsecondary, and institutions of higher learning courses that will further prepare them for cosmetology careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

## Transition to Postsecondary Education

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## **Best Practices**

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The cosmetology educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the cosmetology curriculum. Family, Career and Community Leaders of America is an example of a student organization with many outlets for cosmetology. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of cosmetology careers and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the cosmetology curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The cosmetology curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the cosmetology curriculum that will allow and encourage collaboration with professionals currently in the cosmetology field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the cosmetology classroom. The cosmetology program requires students to obtain a minimum of 100 practical hours, which should include, but is not limited to, hands-on skills practice, field trips, observations, job-shadowing, and preferably some sort of volunteer, internship, or apprenticeship experience. These real-world connections and applications provide a link to all types of students regarding knowledge, skills, and professional dispositions. Thus, supervised collaboration and immersion into the hair care profession are keys to students' success, knowledge, and skills development.

# Professional Organizations

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Aesthetic International Association

[iaaesthetics.org](http://iaaesthetics.org)

American Association of Cosmetology Schools

[beautyschools.org](http://beautyschools.org)

Association for Career and Technical Education

[acteonline.org](http://acteonline.org)

Associated Hair Professionals

[associatedhairprofessionals.com](http://associatedhairprofessionals.com)

Associated Skin Care Professionals

[ascpskincare.com](http://ascpskincare.com)

Association of Cosmetology Salon Professionals (ACSP)

[mycosmetology.org](http://mycosmetology.org)

Intercoiffure America/Canada

[intercoiffure.com](http://intercoiffure.com)

Mississippi ACTE

[mississippiacte.com](http://mississippiacte.com)

Mississippi FCCLA

[mdek12.org/cte/so/fccla](http://mdek12.org/cte/so/fccla)

Mississippi State Board of Cosmetology (MSBC)

[msbc.state.ms.us](http://msbc.state.ms.us)

National Coalition of Estheticians, Manufacturers/Distributors and Associations (NCEA)

[ncea.tv](http://ncea.tv)

National Family, Career and Community Leaders of America (FCCLA)

[hfclainc.org](http://hfclainc.org)

Professional Beauty Association

[probeauty.org](http://probeauty.org)

The American Hair Loss Council

[ahlc.org](http://ahlc.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the cosmetology program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the cosmetology program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Program Orientation

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<b>Competencies and Suggested Objectives</b>	
1.	Discuss the expectations, procedures, and opportunities in the cosmetology program. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Review the curriculum standards, competencies, and objectives.</li><li>Explain school and program policies for emergency procedures and the proper use of lab equipment.</li><li>Identify leadership opportunities in student organizations, such as SkillsUSA.</li><li>Demonstrate 100% accuracy on a federally required safety test.</li></ol>
2.	Describe how cosmetology has been influenced by historical events and individual contributions over the years. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Illustrate major advancements and contributions made in cosmetology during significant periods of history.<ul style="list-style-type: none"><li>Renaissance</li><li>Victorian</li><li>Twentieth century</li><li>Twenty-first century</li></ul></li></ol>
3.	Demonstrate personal and employability skills that are beneficial for a successful career in cosmetology. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Develop skills and habits that are necessary to establish and maintain a successful career in cosmetology.<ul style="list-style-type: none"><li>Communication</li><li>Setting goals</li><li>Time management</li><li>Study skills</li><li>Professional ethics and image</li><li>Good attitude and personality</li></ul></li><li>Create a mission statement that supports personal and professional goals.</li></ol>
4.	Discuss career opportunities available in the cosmetology industry. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Research the education and training required for various career paths in cosmetology.<ul style="list-style-type: none"><li>Hair stylist</li><li>Hair color specialist</li><li>Texture specialist</li><li>Cutting specialist</li><li>Salon trainer</li><li>Salon manager</li><li>Instructor</li><li>Esthetician</li><li>Nail technician</li></ul></li></ol>

**Note:** This unit will be taught throughout the year. Time on tasks will be distributed over the entire year. Students are required to complete a written safety test with 100% accuracy before beginning lab experiences. This test should be documented in each student's file.



## Unit 2: Safety and Infection Control

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### Competencies and Suggested Objectives

1. Describe principles established to prevent or control the spread of infections and diseases in a salon environment.<sup>DOK2</sup>
  - a. Examine the role of state and federal regulatory agencies and the standards they set for the hair care industry.
    - Occupational Safety and Health Administration (OSHA)
    - Environmental Protection Agency (EPA)
    - Center for Disease Control and Prevention (CDC)
    - Mississippi State Department of Health (MSDH)
2. Demonstrate methods of decontamination, disinfection, and sterilization to prevent and control the spread of disease in a salon environment.<sup>DOK2</sup>
  - a. Identify infections within the four groups of organisms that are a potential danger in a salon environment.
    - Bacteria
    - Viruses
    - Fungi
    - Parasites
  - b. Explain the steps involved in the two types of decontamination methods.
  - c. Identify the various types of disinfectants based on the recommended use in salons.
    - Antiseptics
    - Bleach
    - Phenolic
    - Quats
    - Chelating soaps
  - d. Describe universal precautions and the process for cleaning tools, equipment, and salon surfaces.

### Enrichment

1. Pursue a CPR and first aid certification.

## Unit 3: Anatomy and Physiology

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### Competencies and Suggested Objectives

1. Relate an understanding of the basic structure and functions of the human body to the application of services and treatment to clients.<sup>DOK2</sup>
  - a. Describe the basic structure of cells, how they function, and the cell reproduction process.
  - b. Identify the different types of tissue found in the body based on function and location.
    - Connective
    - Epithelial
    - Muscle
    - Nerve
  - c. Explain the basic functions of the major body organs.
    - Brain
    - Heart
    - Kidneys
    - Liver
    - Skin
    - Stomach
  - d. Identify and explain the functions of the main body systems.
    - Skeletal
    - Muscular
    - Nervous
    - Lymphatic
    - Excretory
    - Reproductive
    - Integumentary
    - Circulatory
    - Endocrine
    - Digestive
    - Respiratory

## Unit 4: Introduction to Skin and Nail Care

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### Competencies and Suggested Objectives

1. Relate the basic elements of the skin's anatomy and functions to the techniques that support skin care services. <sup>DOK2</sup>
  - a. Describe the two main layers of the skin and their structures and functions.
  - b. Identify the causes of various conditions in the main types of skin disorders.
    - Lesions
    - Glands
    - Infections
    - Pigment
    - Cancer
    - Acne
  - c. Explain how intrinsic and extrinsic factors, such as aging and dermatitis, affect the skin and identify methods of protection from each factor.
2. Relate the basic elements of nail anatomy and health to the application of nail care services. <sup>DOK2</sup>
  - a. Describe elements of the nail structure, composition, and growth process.
    - Nail plate
    - Nail bed
    - Matrix
    - Cuticle
    - Eponychium
    - Hyponychium
    - Ligaments
    - Nail folds
  - b. Recognize nail diseases and disorders and identify which conditions can be treated in a salon.
    - Bruised
    - Hangnail
    - Discolored
    - Onychia
    - Psoriasis
    - Tinea pedis
3. Relate diet and nutrition principles to beauty care maintenance. <sup>DOK2</sup>
  - a. Identify how essential nutrients benefit the skin, nails, and hair.
    - Water
    - Carbohydrates
    - Fats
    - Minerals
    - Proteins
    - Vitamins
  - b. Identify food sources for essential vitamins such as A, C, D, and E.

c. Explain the basic food groups and identify the recommended amounts in each to support health.

- Grains
- Vegetables
- Fruit
- Milk
- Meat and beans

## Unit 5: Properties of the Hair and Scalp

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<b>Competencies and Suggested Objectives</b>	
1. Develop natural hair care techniques based on structural properties, textural forms, and the hair growth process. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Identify the parts of a hair strand.</li><li>b. Describe the composition and characteristics of the hair root and shaft.</li><li>c. Examine the chemical composition of hair and its reaction when various products are applied during the styling process.</li><li>d. Demonstrate a hair analysis.</li><li>e. Explain the different phases of the hair growth process.</li></ol>
2. Demonstrate hair management skills to apply on all hair types. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Distinguish between hair type, texture, and curl configuration.</li><li>b. Identify properties of natural hair textures.<ul style="list-style-type: none"><li>• Wavy</li><li>• Kinky</li><li>• Wiry</li><li>• Curly (loose and tight)</li><li>• Coily (loose and tight)</li></ul></li></ol>
3. Describe conditions and remedies of hair and scalp disorders. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Explain how various conditions can lead to hair loss.<ul style="list-style-type: none"><li>• Hereditary</li><li>• Aging</li><li>• Nutrition</li><li>• Hormones</li><li>• Medications</li><li>• Health issues</li></ul></li><li>b. Identify hair disorders and diseases of the hair and scalp and the appropriate treatments.<ul style="list-style-type: none"><li>• Canities (gray hair)</li><li>• Hypertrichosis</li><li>• Trichoptilosis</li><li>• Chemical damage</li></ul></li><li>c. Identify scalp disorders or conditions and the appropriate treatment.<ul style="list-style-type: none"><li>• Seborrheic dermatitis</li><li>• Dandruff</li><li>• Alopecia</li><li>• Folliculitis keloidalis</li></ul></li></ol>

## Unit 6: Basic Chemistry and Electricity

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### Competencies and Suggested Objectives

1. Apply basic chemistry concepts that affect the hair, skin, and nails and are essential for providing salon services.<sup>DOK2</sup>
  - a. Define chemistry and explain the difference between organic and inorganic substances.
  - b. Describe matter and identify the types of substances found in its three states: solid, liquid, and gas.
  - c. Identify the processes that occur during the physical and chemical changes of matter.
    - Oxidation
    - Redox
    - Reduction
  - d. Describe the differences between solutions, suspensions, and emulsions and identify the salon products within each category.
  - e. Explain how chemical properties and compound reactions affect the hair, skin, and salon products.
    - Potential hydrogen (pH)
    - pH scale
    - acids
    - alkalis
  - f. Identify and describe purpose of chemical ingredients found in many salon products used by cosmetologists.
    - Alkanolamines
    - Ammonia
    - Glycerin
    - Silicones
    - Volatile alcohols
    - Volatile organic compounds
2. Apply basic concepts of electricity that impact the services and salon environment provided by cosmetologists.<sup>DOK2</sup>
  - a. Explain the nature of electricity and the two types of electric currents.
    - Electric current
    - Conductor
    - Nonconductor
    - Direct current
    - Alternating current
  - b. Identify the different types of electrical measurements.
    - Volt
    - Ampere
    - Milliampere
    - Ohm
    - Watt
    - Kilowatt

- c. Explain how certain devices and processes promote safety with electricity.
- Fuse
  - Circuit breaker
  - Grounding
  - UL guidelines
- d. Identify the purpose of common types of electrical equipment and tools used by cosmetologists.
- Hair dryers
  - Curling irons
  - Heating caps
  - Steaming or vaporizing products
  - Light therapy equipment

# Unit 7: Principles of Hair Design

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## Competencies and Suggested Objectives

1. Demonstrate skills that support the artistic and creative process of hair design.<sup>DOK2</sup>
  - a. Explain the five elements of design for creating hair styles.
    - Line
    - Form
    - Space
    - Texture
    - Color
  - b. Describe the five principles of design that cosmetologists should consider when creating hair styles.
    - Proportion
    - Balance
    - Rhythm
    - Emphasis
    - Harmony
  - c. Explore characteristics that define facial structures.
    - Oval
    - Square
    - Diamond
    - Round
    - Oblong
    - Triangular
  - d. Demonstrate design principles based on special features.
    - Facial profiles
    - Hair partings
    - Wearing eyeglasses
    - Head and forehead shape
    - Oblong
    - Triangular (pear or heart shaped)
    - Designing for men



## Unit 8: Shampooing and Conditioning

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### Competencies and Suggested Objectives

1. Identify salon skills and techniques that promote quality scalp care services.<sup>DOK2</sup>
  - a. Explain the purpose and process of scalp treatments for various hair types and conditions.
    - Normal hair
    - Dry hair
    - Oily
    - Antidandruff treatment
    - Hair brushing
  - b. Identify the function and benefit of various types of shampoos based on hair types and conditions.
    - pH-balanced
    - Conditioning
    - Medicated
    - Clarifying
    - Balancing
    - Dry
  - c. Identify the function and benefit of various types of conditioners based on hair types and conditions.
    - Rinse-out
    - Treatment or repair
    - Leave-in
    - Deep conditioning
2. Demonstrate the steps to perform scalp treatments for basic hair types and conditions.<sup>DOK3</sup>
  - a. Perform the steps in the pre-service procedure.
    - Cleaning and disinfecting
    - Station set up
    - Stylist preparation
    - Greet client
  - b. Perform the steps in the post service procedure.
    - Maintenance tips
    - Schedule next appointment
    - Clean and prepare work area

# Unit 9: Haircutting

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## Competencies and Suggested Objectives

1. Demonstrate the basic principles of hair cutting that support the foundation of hair design.<sup>DOK2</sup>
  - a. Describe the elements for the focus areas of the head that promote quality haircut services.
    - Reference points
    - Areas of the head
    - Elevation
    - Cutting lines
    - Guidelines
    - Over direction
  - b. Identify the purpose of the factors involved in a client consultation prior to a cutting service.
    - Client analysis
    - Face shape
    - Hair analysis
    - Wave pattern
  - c. Identify the purpose and proper handling techniques of basic hair cutting tools.
    - Shears
    - Razors
    - Clippers
    - Combs
    - Trimmers
    - Sectioning clips
  - d. Demonstrate the steps to perform basic cutting techniques, such as, blunt, graduated, and layered methods.
  - e. Describe the purpose and the tools used in advanced cutting procedures.
    - Bangs
    - Curly hair
    - Razor cutting
    - Slide cutting
    - Scissor-over-comb
    - Clippers and trimmers

# Unit 10: Hairstyling

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## Competencies and Suggested Objectives

1. Apply foundational skills and techniques to create hairstyles for clients. <sup>DOK2</sup>
  - a. Identify the products and tools required to create wet hairstyling techniques such as finger waves, pin curls, and roller curls.
  - b. Explain the steps to achieve the desired outcome of various styling techniques.
    - Backcombing and back brushing
    - Hair wrapping
    - Blow-dry styling
  - c. Describe the design purposes of thermal hairstyling and the proper use of thermal irons.
  - d. Identify the materials and procedures to implement various hairstyling techniques for left or right-handed stylists.
    - Horizontal finger waving
    - Curved or sculpted curls
    - Wet set with rollers
    - Blow-drying finishes and hair types
    - Curling short and medium length hair

# Unit 11: Hair Braiding, Additions, and Enhancements

## Competencies and Suggested Objectives

1. Demonstrate braiding and braid extension techniques that provide styles that are specific to clients' specific hair textures.<sup>DOK2</sup>
  - a. Conduct a hair analysis to determine the texture, density, and condition of the hair prior to services.
  - b. Identify the types and purpose of various essential tools to perform braiding techniques.
    - Brushes
    - Combs
    - Dryers
    - Diffuser
    - Clips
  - c. Identify the types and purposes of various materials to perform braiding techniques.
    - Human hair
    - Kanekalon
    - Nylon or synthetic
    - Yarn
    - Lin
    - Yak
  - d. Demonstrate the methods and materials involved in the preparation, procedure, and post-service steps of various braiding services.
    - Rope braid
    - Fishtail braid
    - Invisible braid
    - Single braids with and without extensions
    - Cornrows with extensions
2. Identify the benefits and style techniques of hair additions and enhancements.<sup>DOK2</sup>
  - a. Compare human and synthetic hair based on their advantages, disadvantages, quality, and cost.
  - b. Identify the different types of wigs and the construction and measurement methods.
    - Cap
    - Capless
    - Hand-tied
    - Semi-hand-tied
    - Machine-made
  - c. Demonstrate techniques to perform certain procedures of a wig service, including cutting, cleaning, and coloring.
  - d. Describe the purpose and methods to apply different types of hairpieces, such as integration, toupees, and fashion additions.
  - e. Explain the purpose and procedures to apply different types of hair extensions, such as bonding, fusion bonding, and braid-and-sew methods.

## Unit 12: Chemical Texture Services

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### Competencies and Suggested Objectives

1. Identify principles that cause a chemical change and alter the natural wave pattern of the hair. <sup>DOK1</sup>
  - a. Review the structure, characteristics, and purpose of each layer of the hair.
  - b. Explain the chemical process and techniques of permanent waves.
  - c. Describe the difference between the various types of permanent waves.
    - Acid waves
    - True acid waves
    - Exothermic waves
    - Acid-balanced waves
    - Ammonia-free waves
    - Thio-free waves
    - Low-pH waves
    - Alkaline waves or cold waves
  - d. Identify the steps involved in the process for selecting the appropriate type of permanent wave based on different hair types.
  - e. Explain the difference between thio and hydroxide relaxers.
2. Demonstrate the techniques and procedures to provide chemical texture services. <sup>DOK3</sup>
  - a. Preliminary test curl for a permanent wave
  - b. Permanent wave and processing using a basic permanent wrap
  - c. Permanent wave and processing using a curvature permanent wrap
  - d. Applying thio relaxer to virgin hair
  - e. Applying hydroxide relaxer to virgin hair
  - f. Thio and hydroxide relaxer retouches

# Unit 13: Hair Coloring

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## Competencies and Suggested Objectives

1. Apply principles of the hair, color, and design to establish the foundation for quality hair coloring techniques in the salon. <sup>DOK3</sup>
  - a. Identify the role hair structures such as texture, density, and porosity have in the hair coloring process.
  - b. Explain the elements that are necessary to consider when identifying natural hair color and tones.
    - Melanin
    - Undertones
    - Level system
    - Gray hair
    - Color theory
  - c. Describe the general use of the various types of hair colorings and processes.
    - Temporary
    - Semi-permanent
    - Demi-permanent
    - Permanent
    - Lighteners
    - Decolorizing process
    - Natural and metallic colors
    - Hydrogen peroxide developer
2. Demonstrate techniques of the hair coloring process. <sup>DOK2</sup>
  - a. Explain the steps of communication and preparation necessary for the hair coloring service.
    - Consultation
    - Release form
    - Hair color formulation
    - Mixing permanent colors
  - b. Explain the procedures to apply hair color, including the safety precautions for each step.
    - Preliminary strand test
    - Temporary hair color
    - Semi-permanent
    - Single process
    - Permanent single process retouch with a glaze
  - c. Describe the purpose of the various types of lighteners, toners, and highlighting.
  - d. Describe the guidelines to follow for color correction and how to properly color gray hair.

## Unit 14: Facials and Makeup

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### Competencies and Suggested Objectives

1. Apply techniques to provide hair removal services in a salon. <sup>DOK3</sup>
  - a. Identify the purpose of hair removal services and explain the factors involved in the client consultation process, including conditions for not performing the services.
  - b. Describe the purpose of the various types of permanent and temporary hair removal techniques.
    - Electrolysis
    - Photo epilation
    - Laser
    - Shaving
    - Tweezing
    - Threading
  - c. Demonstrate the steps involved in the pre- and post-service phases for various types of hair removal services.
    - Eyebrow tweezing
    - Eyebrow waxing
    - Body waxing
2. Apply techniques to perform facials in a salon. <sup>DOK3</sup>
  - a. Identify the purposes of facials and explain the factors involved in the client consultation process, including conditions for not performing the service.
  - b. Identify the signs associated with analyzing skin types and conditions.
    - Oily
    - Dry
    - Normal
    - Acne
    - Combination dry and oily
  - c. Describe the purpose and proper use of the various types of skin care products.
    - Cleansers
    - Exfoliants
    - Toners
    - Peels
    - Moisturizers
    - Masks
    - Sunscreens and day protections
  - d. Demonstrate the steps to perform a basic massage and describe the effects of the various movements and manipulations.
  - e. Demonstrate the guidelines, procedures, and use of proper equipment to perform various types of facial treatments.
    - Basic
    - Dry skin
    - Oily skin

- Acne-prone
- Aromatherapy

3. Apply basic makeup techniques that enhance the beauty care services in a salon. <sup>DOK3</sup>
- a. Identify the purpose of various types of cosmetics and the proper tools used to apply each.
- Foundation
  - Concealers
  - Face powder
  - Cheek color
  - Lip color
  - Eye shadow
  - Eyeliners
  - Mascara
- b. Explain the makeup color theory and how colors are chosen based on a client's skin, eye, and hair color.
- c. Demonstrate the steps to perform various types of professional makeup applications.
- Basic
  - Corrective
  - Special occasion
  - Band lashes



# Unit 15: Nail Care Services

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<b>Competencies and Suggested Objectives</b>
<p>1. Demonstrate the fundamental techniques to provide a professional manicure.<sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Identify the purpose of the different types of nail technology tools including their safety, cleaning, and disinfecting procedures.<ul style="list-style-type: none"><li>• Equipment</li><li>• Implements</li><li>• Materials</li><li>• Products</li></ul></li><li>b. Demonstrate the techniques in each step of the different types of manicure services.<ul style="list-style-type: none"><li>• Basic manicure</li><li>• Hand and arm massage</li><li>• Polishing the nails</li><li>• Paraffin wax treatment</li></ul></li></ul>
<p>2. Demonstrate the fundamental techniques to provide a professional pedicure.<sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Identify the purpose of the different types of nail technology tools including their safety, cleaning, and disinfecting procedures.<ul style="list-style-type: none"><li>• Equipment</li><li>• Implements</li><li>• Materials</li><li>• Products</li></ul></li><li>b. Demonstrate the techniques in each step of a basic pedicure, including the foot and leg massage.</li></ul>
<p>3. Apply techniques to provide nail enhancing services for clients.<sup>DOK3</sup></p> <ul style="list-style-type: none"><li>a. Describe the function of different types of nail tips, the required supplies, and how to properly fit them on the clients.</li><li>b. Identify the function of different types of nail wraps.<ul style="list-style-type: none"><li>• Fabric</li><li>• Silk</li><li>• Fiberglass</li><li>• Paper</li><li>• Linen</li></ul></li><li>c. Demonstrate the techniques to apply, maintain, repair, and remove nail tips and wraps.</li><li>d. Demonstrate the application, maintenance, and removal techniques for monomer liquid and polymer powder nail enhancement services.</li><li>e. Demonstrate the application, maintenance, and removal techniques for UV gel procedures.</li></ul>

## Unit 16: Professional Development

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### Competencies and Suggested Objectives

1. Describe the requirements and process to practice cosmetology.<sup>DOK2</sup>
  - a. Review the Mississippi State Board of Cosmetology's website and identify the rules and regulations for becoming a licensed cosmetologist.
    - Theoretical hours
    - Practical hours
    - Written exam
    - Practical exam
  - b. Demonstrate techniques to obtain employment as a cosmetologist.
    - Potential salons research
    - Résumé preparation
    - Employment portfolio development
    - Interview preparation
2. Demonstrate business knowledge and skills that are necessary to operate a salon.<sup>DOK2</sup>
  - a. Compare the differences between salon ownership and renting a booth in an existing salon.
  - b. Describe the different types of salon ownership.
    - Individual
    - Partnership
    - Corporation
    - Franchise
  - c. Develop the necessary business skills and procedures to successfully manage a salon.
    - Pricing of servicing
    - Customer service
    - Computer skills
    - Management
    - Record keeping
    - Managing clients and appointments

# Student Competency Profile

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**Student's Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Program Orientation</b>		
	1.	Discuss the expectations, procedures, and opportunities in the cosmetology program.
	2.	Describe how cosmetology has been influenced by historical events and individual contributions over the years.
	3.	Demonstrate personal and employability skills that are beneficial for a successful career in cosmetology.
	4.	Discuss career opportunities available in the cosmetology industry.
<b>Unit 2: Safety and Infection Control</b>		
	1.	Describe principles established to prevent or control the spread of infections and diseases in a salon environment.
	2.	Demonstrate methods of decontamination, disinfection, and sterilization to prevent and control the spread of disease in a salon environment.
<b>Unit 3: Anatomy and Physiology</b>		
	1.	Relate an understanding of the basic structure and functions of the human body to the application of services and treatment to clients.
<b>Unit 4: Introduction to Skin and Nail Care</b>		
	1.	Relate the basic elements of the skin's anatomy and functions to the techniques that support skin care services.
	2.	Relate the basic elements of nail anatomy and health to the application of nail care services.
	3.	Relate diet and nutrition principles to beauty care maintenance.
<b>Unit 5: Properties of the Hair and Scalp</b>		
	1.	Develop natural hair care techniques based on structural properties, textural forms, and the hair growth process.
	2.	Demonstrate hair management skills to apply on all hair types
	3.	Describe conditions and remedies of hair and scalp disorders.
<b>Unit 6: Basic Chemistry and Electricity</b>		
	1.	Apply basic chemistry concepts that affect the hair, skin, and nails and are essential for providing salon services.

	2.	Apply basic concepts of electricity that impact the services and salon environment provided by cosmetologists.
<b>Unit 7: Principles of Hair Design</b>		
	1.	Demonstrate skills that support the artistic and creative process of hair design.
<b>Unit 8: Shampooing and Conditioning</b>		
	1.	Identify salon skills and techniques that promote quality scalp care services.
	2.	Demonstrate the steps to perform scalp treatments for basic hair types and conditions.
<b>Unit 9: Haircutting</b>		
	1.	Demonstrate the basic principles of hair cutting that support the foundation of hair design.
<b>Unit 10: Hairstyling</b>		
	1.	Apply foundational skills and techniques to create hairstyles for clients.
<b>Unit 11: Hair Braiding, Additions, and Enhancements</b>		
	1.	Demonstrate braiding and braid extension techniques that provide styles that are specific to clients' specific hair textures.
	2.	Identify the benefits and style techniques of hair additions and enhancements.
<b>Unit 12: Chemical Texture Services</b>		
	1.	Identify principles that cause a chemical change and alter the natural wave pattern of the hair.
	2.	Demonstrate the techniques and procedures to provide chemical texture services.
<b>Unit 13: Hair Coloring</b>		
	1.	Apply principles of the hair, color, and design to establish the foundation for quality hair coloring techniques in the salon.
	2.	Demonstrate techniques of the hair coloring process.
<b>Unit 14: Facials and Makeup</b>		
	1.	Apply techniques to provide hair removal services in a salon.
	2.	Apply techniques to perform facials in a salon.
	3.	Apply basic makeup techniques that enhance the beauty care services in a salon.
<b>Unit 15: Nail Care Services</b>		
	1.	Demonstrate the fundamental techniques to provide a professional manicure.
	2.	Demonstrate the fundamental techniques to provide a professional pedicure.
	3.	Apply techniques to provide nail enhancing services for clients.
<b>Unit 16: Professional Development</b>		
	1.	Describe the requirements and process to practice cosmetology.
	2.	Demonstrate business knowledge and skills that are necessary to operate a salon.

## Appendix A: Unit References

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Suggested resources are listed below.

*Cosmetology basic operator.* (1999). Stillwater, OK: Curriculum and Instructional Materials Center.

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# Appendix B: Industry Standards

## National Skills Standards for Cosmetology and Standards for Licensing of Instructors

	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Standard																		
NSSC1		X	X														X	
NSSC2			X				X										X	
NSSC3			X				X										X	
NSSC4		X	X				X			X	X	X	X	X		X	X	
NSSC5			X		X	X			X			X	X	X	X	X		
NSSC6				X											X			
NSSC7				X	X	X			X	X					X			
NSSC8					X	X			X						X			
NSSC9					X												X	
NSSC10					X						X						X	
NSSC11						X			X			X	X	X	X			
NSSC12						X	X		X				X	X	X	X		
NSSC13							X			X		X	X				X	
NSSC14						X	X	X		X	X	X	X	X				
NSSC15						X	X		X		X	X	X	X				
NSSC16						X	X	X	X		X	X						
NSSC17						X	X	X	X		X	X	X					
NSSC18						X	X	X	X		X	X						
NSSC19			X			X	X	X	X		X	X						
NSSC20						X	X		X		X	X	X	X	X			
NSSC21						X	X		X		X	X	X	X				
NSSC22			X		X											X		
NSSC23			X		X											X		
NSSC24					X											X		
NSSC25			X		X		X										X	
NSSC26			X		X		X										X	
NSSC27			X		X		X										X	
NSSC28			X				X										X	
NSSC29			X				X										X	
NSSC30									X									X
NSSC31									X									X
NSSC32									X	X	X	X	X	X	X	X	X	X

<sup>1</sup> Milady's standard cosmetology. (2012). Clifton Park, NY: Cengage Learning. (<http://www.milady.com>)

NSSC1 *History and career opportunities.*  
 Explain the origins of appearance enhancement.  
 Name the advancements made in cosmetology during the nineteenth, twentieth, and early twenty-first centuries.

NSSC2 *Life skills.*  
 List the principles that contribute to personal and professional success.

- Create a mission statement.
  - Explain how to set long-term and short-term goals.
  - Discuss the most effective ways to manage time.
  - Describe good study habits.
  - Define ethics.
  - List the characteristics of a healthy, positive attitude.
- NSSC3     *Your professional image.*  
 Understand the importance of professional hygiene.  
 Explain the concept of dressing for success.  
 Demonstrate an understanding of ergonomic principles and ergonomically correct postures and movement.
- NSSC4     *Communicating for success.*  
 List the golden rules of human relations.  
 Explain the definition of effective communication.  
 Conduct a successful client consultation/needs assessment.  
 Handle an unhappy client.  
 Build open lines of communication with coworkers.
- NSSC5     *Infection control: principles and practices.*  
 Understand state laws and rules and the difference between them.  
 List the types and classifications of bacteria.  
 Define hepatitis and Human Immunodeficiency Virus (HIV) and explain how they are transmitted.  
 Explain the differences between cleaning, disinfecting, and sterilizing.  
 List the types of disinfectants and how they are used.  
 Discuss universal precautions.  
 List your responsibilities as a salon professional.  
 Describe how to safely clean and disinfect salon tools and implements.
- NSSC6     *General anatomy and physiology.*  
 Define and explain the importance of anatomy, physiology, and histology to the cosmetology profession.  
 Describe cells, their structure, and their reproduction.  
 Define tissue and identify the types of tissues found in the body.  
 Name the nine major body organs and the eleven main body systems and explain their basic functions.
- NSSC7     *Skin structures and growth.*  
 Describe the structure and composition of the skin.  
 List the functions of the skin.  
 List the classes of nutrients essential for good health.  
 List the food groups and dietary guidelines recommended by the U.S. Department of Agriculture (USDA).  
 List and describe the vitamins that can help the skin.
- NSSC8     *Skin disorders and diseases.*  
 Recognize common skin lesions.  
 Describe the disorders of the sebaceous glands.  
 Name and describe changes in skin pigmentation.  
 Identify the forms of skin cancer.  
 Understand the two major causes of acne and how to treat them.  
 List the factors that contribute to the aging of the skin.  
 Explain the effects of overexposure to the sun on the skin.  
 Understand what contact dermatitis is and know how it can be prevented.

- NSSC9 *Nail structure and growth.*  
Describe the structure and composition of nails.  
Discuss how nails grow.
- NSSC10 *Nail disorders and diseases.*  
List and describe the various disorders and irregularities of nails.  
Recognize diseases of the nails that should not be treated in the salon.
- NSSC11 *Properties of the hair and scalp.*  
Name and describe the structures of the hair root.  
List and describe the three main layers of the hair shaft.  
Describe the hair growth cycles.  
Discuss the types of hair loss and their causes.  
Describe the options for hair loss treatments.  
Recognize hair and scalp disorders commonly seen in the salon and school and know which ones can be treated by cosmetologists.  
List and describe the factors that should be considered in a hair and scalp analysis.
- NSSC12 *Basics of chemistry.*  
Explain the difference between organic and inorganic chemistry.  
Describe the different states of matter: solid, liquid, and gas.  
Describe oxidation-reduction (redox) reactions.  
Explain the differences between pure substances and physical mixtures.  
Explain the difference among solutions, suspensions, and emulsions.  
Explain pH and the pH scale.
- NSSC13 *Basics of electricity.*  
Define the nature of electricity and the two types of electric current.  
Define electrical measurements.  
Understand the principles of electrical equipment safety.  
Define the main electric modalities used in cosmetology.  
Describe other types of electrical equipment that cosmetologists use and describe how to use them.  
Explain electromagnetic spectrum, visible spectrum of light, and invisible light.  
Describe the types of light therapy and their benefits.
- NSSC14 *Principles of hair design.*  
Describe the possible sources of hair design inspiration.  
List the five elements of hair design.  
List the five principles of hair design.  
Understand the influence of hair type on hairstyle.  
Identify different facial shapes and demonstrate how to design hairstyles to enhance or camouflage facial features.  
Explain design consideration for men.
- NSSC15 *Scalp care, shampooing, and conditioning.*  
Explain the two most important requirements for scalp care.  
Describe the benefits of scalp massage.  
Treat scalp and hair that are dry, oily, or dandruff ridden.  
Explain the role of hair brushing to a healthy scalp.  
Discuss the uses and benefits of the various types of shampoo.  
Discuss the uses and benefits of the various types of conditioner.  
Demonstrate the appropriate draping for a basic shampooing and conditioning, and draping for a chemical service.  
Identify the Three-Part Procedure and explain why it is useful.



- NSSC16 *Haircutting.*  
 Identify reference points on the head form and understand their role in haircutting.  
 Define angles, elevations, and guidance.  
 List the factors involved in a successful client consultation.  
 Explain the use of the various tools of haircutting.  
 Name three things you can do to ensure good posture and body position while cutting hair.  
 Perform the four basic haircuts.  
 Discuss and explain three different texturizing techniques performed with shears.  
 Explain what a clipper cut is.  
 Identify the uses of a trimmer.
- NSSC17 *Hairstyling.*  
 Demonstrate finger waving, pin curling, roller setting, and hair wrapping.  
 Demonstrate various blow-dry styling techniques.  
 Demonstrate the proper use of thermal irons.  
 Demonstrate various thermal iron manipulations and explain how they are used.  
 Describe the three types of hair pressing.  
 Demonstrate the procedures for soft pressing and hard pressing.  
 Demonstrate three basic techniques of styling long hair.
- NSSC18 *Braiding and braid extensions.*  
 Explain how to prepare the hair for braiding.  
 Demonstrate the procedure for cornrowing.
- NSSC19 *Wigs and hair additions.*  
 Explain the differences between human hair and synthetic hair.  
 Describe the two basic categories of wigs.  
 Describe several types of hairpieces and their uses.  
 Explain several different methods of attaching hair extensions.
- NSSC20 *Chemical texture services.*  
 Explain the structure and purpose of each of the hair's layers.  
 Explain chemical actions that take place during permanent waving.  
 Explain the difference between an alkaline wave and a true acid wave.  
 Explain the purpose of neutralization in permanent waving.  
 Describe how thio relaxers straighten the hair.  
 Describe how hydroxide relaxers straighten the hair.  
 Describe curl re-forming and what it is best used for.
- NSSC21 *Haircoloring.*  
 List the reasons why people color their hair.  
 Explain how the hair's porosity affects hair color.  
 Understand the types of melanin found in hair.  
 Define and identify levels and their role in formulating hair color.  
 Identify primary, secondary, and tertiary colors.  
 Know what roles tone and intensity play in hair color.  
 List and describe the categories of hair color.  
 Explain the role of hydrogen peroxide in a hair color formula.  
 Explain the action of high lighteners.  
 List the four key questions to ask when formulating a hair color.  
 Understand why a patch test is useful in haircoloring.  
 Define what a preliminary strand test is and why it is used.  
 List and describe the procedure for a virgin single-process color service.  
 Understand the two processes involved in a double process haircoloring.  
 Describe the various forms of hair lightener.  
 Understand the purpose and use of toners.

Name and describe the three most commonly used methods for highlighting.  
Know how to properly cover gray hair.  
Know the rules of color correction.  
Know the safety precautions to follow during the hair color process.

NSSC22

*Hair removal.*

Describe the elements of a client consultation for hair removal.  
Name the conditions that contraindicate hair removal in the salon.  
Identify and describe three methods of permanent hair removal.  
Demonstrate the techniques involved in temporary hair removal.

NSSC23

*Facials.*

Explain the importance of skin analysis and client consultation.  
Understand contraindications and the use of a health screening form to safely perform facial treatments.  
List and describe various skin types and conditions.  
Describe different types of products used in facial treatments.  
Perform a client consultation.  
Identify the various types of massage movements and their physiological effects.  
Describe the basic types of electrical equipment used in facial treatments.  
Identify the basic concepts of electrotherapy and light therapy techniques.

NSSC24

*Facial makeup.*

Describe the various types of cosmetics and their uses.  
Demonstrate an understanding of cosmetic color theory.  
Perform a consultation for the basic makeup procedure for any occasion.  
Understand the use of special occasion makeup.  
Identify different facial types and demonstrate procedures for basic corrective makeup.  
Demonstrate the application and removal of artificial lashes.

NSSC25

*Manicuring.*

Identify the four types of nail implements and/or tools required to perform a manicure.  
Explain the difference between reusable and disposable implements.  
Describe the importance of hand washing in nail services.  
Explain why a consultation is necessary each time a client has a service in the salon.  
Name the five basic nail shapes for women.  
Name the most popular nail shape for men.  
List the types of massage movements most appropriate for a hand and arm massage.  
Explain the difference between a basic manicure and a spa manicure.  
Describe how aromatherapy is used in manicuring services.  
Explain the use and benefits of paraffin wax in manicuring.  
Name the correct cleaning and disinfection procedure for nail implements and tools.  
Describe a proper setup for the manicuring table.  
List the steps in the post-service procedure.  
List the steps taken if there is an exposure incident in the salon.  
List the steps in the basic manicure.  
Describe the proper technique for the application of nail polish.  
Describe the procedure for a paraffin wax hand treatment before a manicure.

NSSC26

*Pedicuring.*

Identify and explain the equipment used when performing pedicures.  
Identify and explain three materials used when performing pedicures.  
Describe a callus softener and how it is best used.  
Explain the differences between a basic and a spa pedicure.  
Describe reflexology and its use in pedicuring.  
Know why consistent cleaning and disinfection of pedicure baths must be performed.

Know and describe the steps involved in the proper cleaning and disinfecting of whirlpool foot spas and air-jet basins.  
Demonstrate the proper procedures for a basic pedicure.  
Demonstrate a foot and leg massage.

- NSSC27 *Nail tips and wraps.*  
Identify the supplies, in addition to your basic manicuring table, that you need for nail tip application. Name and describe the types of nail tips available and why it is important to properly fit them for your client.  
List the types of fabrics used in nail wraps and explain the benefits of using each.  
Demonstrate the stop, rock, and hold method of applying nail tips.  
Demonstrate the Nail Tip Application Procedure.  
Demonstrate the Nail Tip Removal Procedure.  
Demonstrate the Nail Wrap Application Procedure.  
Describe the main difference between performing the Two-Week Fabric Wrap Maintenance and the Four-Week Fabric Wrap Maintenance.  
Demonstrate how to remove fabric wraps and what to avoid.
- NSSC28 *Monomer liquid and polymer.*  
Explain monomer liquid and polymer powder nail enhancement chemistry and how it works.  
Describe the apex, stress area, and sidewall, and tell where each is located on the nail enhancement.  
Demonstrate the proper procedures for applying one-color monomer liquid and polymer powder nail enhancements over tips and natural nails.  
Demonstrate the proper procedures for applying two-color monomer liquid and polymer powder nail enhancements using forms over nail tips and on natural nails.  
Describe how to perform a one-color maintenance service on nail enhancements using monomer liquid and polymer powder.  
Demonstrate how to perform crack repair procedures.  
Implement the proper procedure for removing monomer liquid and polymer powder nail enhancements.
- NSSC29 *UV gels.*  
Describe the chemistry and main ingredients of UV gels.  
Describe when to use the one-color and two-color methods for applying UV gels.  
Name and describe the types of UV gels used in current systems.  
Identify the supplies needed for UV gel application.  
Determine when to use UV gels.  
Discuss the differences between UV light units and UV lamps.  
Describe how to apply one-color UV gel on tips and natural nails.  
Describe how to apply UV gels over forms.  
Describe how to maintain UV gel nail enhancements.  
Explain how to correctly remove hard UV gels.  
Explain how to correctly remove soft UV gels.
- NSSC30 *Seeking employment.*  
Understand what is involved in securing the required credentials for cosmetology in your state and know the process for taking and passing your state licensing examination.  
Start networking and preparing to find a job by using the Inventory or Personal Characteristics and Technical Skills.  
Describe the different salon business categories.  
Write a cover letter and resume and prepare an employment portfolio.  
Know how to explore the job market, research, potential employers, and operate within the legal aspects of employment.

- NSSC31 *On the job.*  
Describe what is expected of a new employee and what this means in terms of your everyday behavior.  
List the habits of a good salon team player.  
Describe three different ways in which salon professionals are compensated.  
Explain the principles of selling products and services in the salon.  
List the most effective ways to build a client base.
- NSSC32 *The salon business.*  
Identify two options for going into business for yourself.  
Understand the responsibilities of a booth renter.  
List the basic factors to be considered when opening a salon.  
Distinguish the types of salon ownership.  
Identify the information that should be included in a business plan.  
Understand the importance of record keeping.  
Recognize the elements of successful salon operations.  
Explain why selling services and products is a vital aspect of a salon's success.





## 2022 Architecture and Drafting

Program CIP: 15.1301—Drafting and Design Technology/Technician, General

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The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendices. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE architecture and drafting curriculum is aligned to the following standards:

## **American Design Drafting Association**

The American Design Drafting Association (ADDA) is an international nonprofit, professional membership and educational organization born in Bartlesville, Oklahoma in 1948. Its purpose is to provide members with information, education, training, and professional development.

[adda.org](http://adda.org)

## **International Society for Technology in Education Standards (ISTE)**

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Permission does not constitute an endorsement by ISTE.

[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oea/college-and-career-readiness-standards](http://mdek12.org/oea/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

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Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

Architecture and drafting is a pathway in the architecture and construction career cluster. Study in this program allows students to produce workable drawings on the drawing board and with the computer. Upon successful completion of the program, students will be qualified for an entry-level drafting or related position or may pursue postsecondary education. Skills developed through the course of study assist students in meeting requirements for the ADDA and/or Autodesk Certified User—CAD certification. Students are also provided the opportunity to participate in career and technical student organizations.

## College, Career, and Certifications

An industry-recognized certification is available through the American Design Drafting Association, the American Digital Design Association, and Autodesk Certified User – CAD. Ample opportunities exist for continuing education in both two- and four-year degree options, as well.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as a ninth grader. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. It is preferred that the student complete the program in consecutive years. If not, it is recommended the student complete the program in no more than three years. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
  2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
  3. Instructor approval and TABE reading score (eighth grade or higher)
- or**
1. TABE reading and math score (eighth grade or higher)
  2. Instructor approval
- or**
1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Applied Academic Credit

The latest academic credit information can be found at [mdek12.org/ese/approved-course-for-the-secondary-schools](http://mdek12.org/ese/approved-course-for-the-secondary-schools).

**Teacher Licensure**

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

**Professional Learning**

If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

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## Option 1—Four 1-Carnegie-Unit Courses

This curriculum consists of four one-credit courses that should be completed in the following sequence:

1. **Concepts of Drafting—Course Code: 994302**
2. **Drafting and Design—Course Code: 994303**
3. **Architectural Drafting—Course Code: 994304**
4. **Architectural Drafting Application—Course Code: 994305**

### **Course Description: Concepts of Drafting**

This course includes an introduction to the field as well as fundamentals of safety, math, geometric construction, orthographic projection, and computer-aided drafting (CAD) applications. This is a one-Carnegie-unit course.

### **Course Description: Drafting and Design**

This course emphasizes an overview of safety and an in-depth study of the elements of drafting. It gives students real-world, hands-on practice in these areas. This one-Carnegie-unit course should only be taken after the student successfully passes Concepts of Drafting.

### **Course Description: Architectural Drafting**

This course includes a study of mathematics used in drafting and techniques used in residential and commercial drafting. It also reinforces safety related to the drafting and design industry. This course should only be taken after the student successfully passes Drafting and Design.

### **Course Description: Architectural Drafting Application**

This course is a continued study of residential drafting techniques. It includes a study of the uses of drafting and design in today's global marketplace. This course should only be taken after the student successfully passes Architectural Drafting.

**Concepts of Drafting—Course Code: 994302**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
1	Orientation	8
2	Fundamentals of Student Organizations	7
3	Introduction to Drafting	25
4	Lettering	10
5	Geometric Construction	25
6	Computer-Aided Drafting (CAD)	30
7	Orthographic Projection	35
<b>Total</b>		<b>140</b>

**Drafting and Design—Course Code: 994303**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
8	Dimensioning	21
9	Sectional Views	26
10	Auxiliary Views	21
11	Pictorial Drawings	26
12	Machine Drafting	46
<b>Total</b>		<b>140</b>

**Architectural Drafting—Course Code: 994304**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
13	Orientation and Safety	6
14	Architectural Drafting Math	39
15	Residential Architectural Drafting I	95
<b>Total</b>		<b>140</b>

**Architectural Drafting Application—Course Code: 994305**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
16	Residential Architectural Drafting II	90
17	Residential Architectural Drafting III	50
<b>Total</b>		<b>140</b>

## Option 2—Two 2-Carnegie Unit Courses

This curriculum consists of two 2-credit courses that should be completed in the following sequence:

1. **Architectural Design and Drafting I—Course Code: 994300**
2. **Architectural Design and Drafting II—Course Code: 994301**

### Course Description: Architectural Design and Drafting I

This course is the entry-level course of the secondary architecture and drafting program. Students will gain foundational competencies related to orientation, safety, leadership and personal development, drafting, and CAD skills.

### Course Description: Architectural Design and Drafting II

This course is the upper-level course of the secondary architecture and drafting program. Students will gain foundational competencies related to safety, advanced leadership and personal development, architectural drafting, and CAD skills. The architectural drafting section includes floor plans, elevations, foundations, and sections. This course should only be taken after the student successfully passes Architectural Design and Drafting I.

### Architectural Design and Drafting I—Course Code: 994300

Unit	Unit Name	Hours
1	Orientation	8
2	Fundamentals of Student Organizations	7
3	Introduction to Drafting	25
4	Lettering	10
5	Geometric Construction	25
6	Computer-Aided Drafting (CAD)	30
7	Orthographic Projection	35
8	Dimensioning	21
9	Sectional Views	26
10	Auxiliary Views	21
11	Pictorial Drawings	26
12	Machine Drafting	46
<b>Total</b>		<b>280</b>

### Architectural Design and Drafting II—Course Code: 994301

Unit	Unit Name	Hours
13	Orientation and Safety	6
14	Architectural Drafting Math	39
15	Residential Architectural Drafting I	95
16	Residential Architectural Drafting II	90
17	Residential Architectural Drafting III	50
<b>Total</b>		<b>280</b>



# Career Pathway Outlook

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## Overview

Architectural drafting is a method of documenting geometric dimensioning and characteristics, including shape, size, color, and surface finish. Many companies across the globe use drafters to record the thoughts of engineers and scientists in written language through the use of shape and alphabet association. Without drafters to document processes, construction and manufacturing would suffer in production as well as quality. Architectural design allows people of many varying cultures and languages to communicate without barriers in the creation of today's greatest accomplishments.

## Needs of the Future Workforce

There will be a need for drafters in the future. Mississippi can expect to see a 10.5% increase in mechanical drafters and a 3.8% increase in survey technicians over the next eight to 10 years.

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2020
Architectural and Civil Drafters	450	450	0	0.0%	\$23.42
Mechanical Drafters	190	210	20	10.5%	\$25.56
Surveying and Mapping Technicians	530	550	20	3.8%	\$19.15

Source: Mississippi Department of Employment Security; [mdes.ms.gov](http://mdes.ms.gov) (2020).

## Perkins V Requirements and Academic Infusion

The architecture and drafting curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in drafting fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for drafting careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

## Transition to Postsecondary Education

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## **Best Practices**

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The architecture and drafting educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' backgrounds, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the architecture and drafting curriculum. SkillsUSA and Technology Student Association (TSA) are examples of student organizations with many outlets for drafting. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of drafting careers and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the architecture and drafting curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The architecture and drafting curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the architecture and drafting curriculum that will allow and encourage collaboration with professionals currently in the architecture and drafting field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the architecture and drafting classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and drafting professionals. Thus, supervised collaboration and immersion into the drafting industry around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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American Design Drafting Association (ADDA)  
[adda.org](http://adda.org)

Technology Student Association (TSA)  
[tsaweb.org](http://tsaweb.org)

SkillsUSA  
[skillsusa.org](http://skillsusa.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future, if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Many of the units include an enrichment section at the end. If the architecture and drafting program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the architecture and drafting program is using a national certification or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested. It is the responsibility of the teacher to ensure all competencies for the selected assessment are covered throughout the year.

# Unit 1: Orientation

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<b>Competencies and Suggested Objectives</b>
1. Demonstrate understanding of local program requirements. <sup>DOK1</sup> a. Observe local student handbook and classroom requirements.
2. Research career opportunities, earnings, and educational requirements in the architecture industry. <sup>DOK1</sup> a. Describe earnings, educational requirements, career ladder, and organizations associated with the various fields of the architecture industry (i.e., residential, commercial, and industrial).

**Note:** This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

## Unit 2: Fundamentals of Student Organizations

<b>Competencies and Suggested Objectives</b>	
1.	Discuss the history, mission, and purpose of student organizations, including SkillsUSA and TSA. <sup>DOK1</sup> a. Trace the history of the program area student organization. b. Identify the mission, purpose, and/or goals of the program area’s student organization.
2.	Explore the advantages of membership in a student organization. <sup>DOK1</sup> a. Discuss the membership process for the program area’s student organization. b. Explain the activities related to the local chapter and the state and national organizations.
3.	Discuss the organization’s brand resources. <sup>DOK1</sup> a. Identify the motto, creed, and/or pledge and discuss their meanings. b. Recognize related brand resources. <ul style="list-style-type: none"> <li>• Emblem</li> <li>• Colors</li> <li>• Official attire</li> <li>• Logos</li> <li>• Graphic standards</li> </ul>
4.	Describe the importance of effective communication skills. <sup>DOK1</sup> a. Demonstrate verbal and nonverbal communication skills. b. Apply appropriate speaking and listening skills to class- and work-related situations.
5.	Apply leadership skills to class- and work-related situations and 21st century skills. <sup>DOK2</sup> a. Define leadership. b. Discuss the attributes of a leader. c. Identify the roles a leader can assume.
6.	Utilize team-building skills in class- and work-related situations. <sup>DOK2</sup> a. Define team building. b. Discuss the attributes of a team. c. Identify the roles included in a team.
7.	Discuss the various competitions offered through the student organization(s). <sup>DOK1</sup> a. Describe each of the competitions and the skills needed to accomplish the tasks. b. Perform the tasks needed to complete an assigned requirement for a competition.
<b>Note:</b> This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.	

## Unit 3: Introduction to Drafting

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<b>Competencies and Suggested Objectives</b>	
1.	Explain the purpose of technical drawing and freehand technical sketches. <sup>DOK2</sup> a. Identify appropriate techniques for technical drawing and freehand technical sketches.
2.	Create freehand technical sketches. <sup>DOK2</sup> a. Identify appropriate techniques for freehand sketches. b. Construct a freehand technical sketch. c. Recognize the alphabet of lines.
3.	Identify and demonstrate drafting tools and media. <sup>DOK2</sup> a. Identify drafting tools. b. Examine media and various sheet sizes. c. Interpret architecture and engineering scale units.
4.	Demonstrate skills in mathematical concepts related to drafting technology. <sup>DOK2</sup> a. Use mathematical concepts to solve problems of measurement. b. Perform addition and subtraction of fractions and decimals. (1/16, 1/8, 1/4, 1/2) c. Convert fractions to decimals and decimals to fractions. (1/16, 1/8, 1/4, 1/2)

**Note:** This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

## Unit 4: Lettering

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Demonstrate the techniques of lettering and construct uppercase gothic letters and numerals. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Construct freehand letters and numerals in various script fonts.</li><li>b. Apply measurements for layout of guidelines.</li></ol></li></ol>



## Unit 5: Geometric Construction

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<b>Competencies and Suggested Objectives</b>
1. Define basic geometric shapes and terms. <sup>DOK2</sup> a. Define geometric terms and identify shapes.
2. Construct various geometric shapes using constructional techniques on a drawing table. <sup>DOK2</sup> a. Construct various geometric shapes using constructional techniques on a drawing table. <ul style="list-style-type: none"><li>• Bisect a line, arc, and angle.</li><li>• Construct a perpendicular line from a point on a line.</li><li>• Divide a line into equal parts.</li><li>• Draw tangencies.</li><li>• Construct various polygons.</li><li>• Construct an octagon.</li><li>• Construct a hexagon.</li><li>• Construct a line parallel to a given line or plane.</li></ul>

## Unit 6: Computer-Aided Drafting (CAD)

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<b>Competencies and Suggested Objectives</b>	
1. Use CAD hardware and software. <sup>DOK2</sup>	
a. Recognize the various hardware components of a CAD system.	<ul style="list-style-type: none"><li>• Define CAD hardware/software terms.</li><li>• Demonstrate care and maintenance of computer software/hardware.</li><li>• Start up/shut down CAD system.</li><li>• Operate plotter/printer.</li></ul>
2. Create text using appropriate style and size on a CAD system. <sup>DOK2</sup>	
a. Demonstrate inserting text using CAD.	<ul style="list-style-type: none"><li>• Select text style.</li><li>• Create various text sizes.</li><li>• Utilize CAD text-edit commands.</li><li>• Create borders and title blocks for various sheet sizes.</li></ul>
3. Create a basic CAD drawing. <sup>DOK3</sup>	
a. Identify basic commands for CAD drawing.	
b. Discuss and apply absolute, relative, and polar coordinates.	
c. Construct a CAD drawing using endpoint, midpoint, and intersection object snaps correctly.	

# Unit 7: Orthographic Projection

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<b>Competencies and Suggested Objectives</b>	
1. Describe various aspects of orthographic projections and other drawing media. <sup>DOK2</sup>	
a. Describe terms, views, line types, and the spacing of views used in orthographic projections.	
b. Describe and apply formulas for centering and spacing of views on the drawing media.	
2. Construct principal views in orthographic projections. <sup>DOK3</sup>	
a. Construct principal views in orthographic projections and apply calculations to determine missing measurements and angles when applicable.	
3. Construct orthographic views using a CAD station. <sup>DOK3</sup>	

# Unit 8: Dimensioning

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<b>Competencies and Suggested Objectives</b>
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|--|
| <ol style="list-style-type: none"><li>1. Apply general rules, line types, and notes for dimensioning per ANSI standards. <sup>DOK3</sup><ol style="list-style-type: none"><li>a. Identify line types used in dimensioning.</li><li>b. Dimension objects with various geometric shapes.</li><li>c. Apply size and location dimensions of an object.</li></ol></li></ol> |
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## Unit 9: Sectional Views

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<b>Competencies and Suggested Objectives</b>
1. Demonstrate creating sectional views. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Describe and identify the types of sectional views.</li><li>Construct full, half, revolved, aligned, removed, offset, and broken-out section views.</li></ol>
2. Construct a sectional view using CAD. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Identify CAD commands used to create sectional drawings.</li></ol>

# Unit 10: Auxiliary Views

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<b>Competencies and Suggested Objectives</b>	
1. Demonstrate creating auxiliary views. <sup>DOK2</sup>	
a. Describe and construct primary auxiliary views.	
b. Relate perpendicular and parallel between views.	
2. Construct a primary auxiliary view using CAD. <sup>DOK2</sup>	
a. Identify and use CAD commands used to create a primary auxiliary view.	

# Unit 11: Pictorial Drawings

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<b>Competencies and Suggested Objectives</b>	
1. Identify and describe the different types of pictorial drawings. <sup>DOK1</sup>	a. Describe the methods of constructing pictorial drawings.
2. Construct and analyze pictorial drawings. <sup>DOK3</sup>	a. Construct an isometric drawing. b. Identify the three isometric axes. c. Construct an oblique drawing. d. Distinguish between Cavalier (depth full scale) and Cabinet (depth half scale). e. Construct a perspective drawing.
3. Construct an isometric drawing on the CAD system. <sup>DOK3</sup>	a. Identify and use CAD commands to create an isometric drawing.

# Unit 12: Machine Drafting

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<b>Competencies and Suggested Objectives</b>	
1. Identify terms and symbols associated with machining and manufacturing processes.	DOK2
2. Identify thread forms and representations of threads and fasteners.	DOK3
a. Describe uses of threads.	
b. Describe types of threads.	
c. Match thread terms with definitions.	
d. Illustrate the various thread representations.	
e. Calculate thread pitch and length of threads.	
f. Draw an internal and external thread form.	
g. Interpret thread notes.	
h. Create a detailed machine drawing illustrating threads.	
i. Describe methods of thread representation.	
j. Draw an internal and external thread form.	
3. Produce an assembly drawing.	DOK3
a. Produce a basic assembly drawing with fasteners.	



## Unit 13: Orientation and Safety

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### Competencies and Suggested Objectives

1. Review and demonstrate understanding of local program requirements. <sup>DOK1</sup>
  - a. Observe local student handbook and classroom requirements.
2. Review leadership skills and personal development opportunities provided to students by student organizations, including SkillsUSA and TSA. <sup>DOK1</sup>
  - a. Demonstrate effective team-building and leadership skills.
  - b. Practice appropriate work ethics.
3. Review and research career opportunities, earnings, and educational requirements in the architecture industry. <sup>DOK1</sup>
  - a. Describe earnings, educational requirements, career ladder, and organizations associated with the various fields of the architecture industry (i.e., residential, commercial, and industrial).

**Note:** This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

### Enrichment

1. Discuss the International Building Code, the Americans with Disabilities Act, types of zoning, and other factors that influence how buildings (both residential and commercial) are designed and constructed.

# Unit 14: Architectural Drafting Math

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<b>Competencies and Suggested Objectives</b>	
1.	Calculate linear measurements. <sup>DOK2</sup>
2.	Read and interpret the architect and engineering scale. <sup>DOK2</sup> a. Read and interpret the architecture and engineering scale for architectural and mechanical applications.
3.	Calculate residential square footage. <sup>DOK2</sup> a. Calculate residential square footage for area, volume, and plan specification. b. Calculate net square feet, gross square feet, and BOMA calculations.
4.	Calculate and apply spatial requirements for residential design. <sup>DOK2</sup>
5.	Estimate residential cost based on specified cost per square foot. <sup>DOK3</sup>
6.	Discuss industry material sizes (e.g., nominal size vs. actual size of wood members, linear feet, cubic yards, etc.). <sup>DOK1</sup>

**Note:** This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

# Unit 15: Residential Architectural Drafting I

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<b>Competencies and Suggested Objectives</b>	
1.	Perform all necessary calculations, apply spatial and local code requirements, and estimate the cost of a residential floor plan design. <sup>DOK3</sup>
2.	Produce sketches in planning the three main residential areas. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Describe requirements for the three main residential areas.</li><li>Sketch rooms, including service, living, sleeping areas, and floor plan.</li></ol>
3.	Produce an architecturally correct floor plan. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Identify architectural terms and symbols related to floor plans.</li><li>Construct architectural letters.</li><li>Draw and dimension a floor plan.</li></ol>

## Unit 16: Residential Architectural Drafting II

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<b>Competencies and Suggested Objectives</b>	
1.	Calculate all necessary measurements, interpreting the architecture and engineering scale, and apply those and local code requirements to exterior elevation and electrical plan designs. <sup>DOK3</sup>
2.	Draw and note exterior elevations. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Identify architectural terms, symbols, and requirements related to elevations.</li><li>Construct a front elevation.</li><li>Construct side elevations.</li><li>Construct a rear elevation.</li></ol>
3.	Produce an electrical plan. <sup>DOK3</sup> <ol style="list-style-type: none"><li>Describe terms, symbols, and requirements related to an electrical plan.</li><li>Draw an electrical plan.</li></ol>

## Unit 17: Residential Architectural Drafting III

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<b>Competencies and Suggested Objectives</b>	
1.	Perform all necessary calculations, apply spatial and local code requirements, and estimate the cost of various residential designs, including those of an exterior wall section, foundation plan, plot/site plan, plumbing and HVAC plans. <sup>DOK3</sup>
2.	Draw, dimension, and label an exterior wall section. <sup>DOK3</sup> a. Identify building material terms, symbols, and requirements. b. Draw, dimension, and label a typical exterior wall section.
3.	Produce an architecturally correct foundation plan. <sup>DOK3</sup> a. Describe terms, symbols, and requirements related to foundation plans. b. Draw and dimension a foundation plan. c. Draw footing details.
4.	Develop a residential plot/site plan. <sup>DOK3</sup> a. Describe terms, symbols, and requirements related to a plot/site plan. b. Draw a plot/site plan.
5.	Discuss plumbing and HVAC plans. <sup>DOK3</sup> a. Describe terms, symbols, and requirements related to a plumbing and HVAC plan.

# Student Competency Profile

---

Student's Name: \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Orientation</b>		
	1.	Demonstrate understanding of local program requirements.
	2.	Research career opportunities, earnings, and educational requirements in the architecture industry.
<b>Unit 2: Fundamentals of Student Organizations</b>		
	1.	Discuss the history, mission, and purpose of student organizations, including SkillsUSA and TSA.
	2.	Explore the advantages of membership in a student organization.
	3.	Discuss the organization's brand resources.
	4.	Describe the importance of effective communication skills.
	5.	Apply leadership skills to class- and work-related situations and 21st century skills.
	6.	Utilize team-building skills in class- and work-related situations.
	7.	Discuss the various competitions offered through the student organization(s).
<b>Unit 3: Introduction to Drafting</b>		
	1.	Explain the purpose of technical drawing and freehand technical sketches.
	2.	Create freehand technical sketches.
	3.	Identify and demonstrate drafting tools and media.
	4.	Demonstrate skills in mathematical concepts related to drafting technology.
<b>Unit 4: Lettering</b>		
	1.	Demonstrate the techniques of lettering and construct uppercase gothic letters and numerals.
<b>Unit 5: Geometric Construction</b>		
	1.	Define basic geometric shapes and terms.
	2.	Construct various geometric shapes using constructional techniques on a drawing table.

<b>Unit 6: Computer-Aided Drafting (CAD)</b>		
	1.	Use CAD hardware and software.
	2.	Create text using appropriate style and size on a CAD system.
	3.	Create a basic CAD drawing.
<b>Unit 7: Orthographic Projection</b>		
	1.	Describe various aspects of orthographic projections and other drawing media.
	2.	Construct principal views in orthographic projections.
	3.	Construct orthographic views using a CAD station.
<b>Unit 8: Dimensioning</b>		
	1.	Apply general rules, line types, and notes for dimensioning per ANSI standards.
<b>Unit 9: Sectional Views</b>		
	1.	Demonstrate creating sectional views.
	2.	Construct a sectional view using CAD.
<b>Unit 10: Auxiliary Views</b>		
	1.	Demonstrate creating auxiliary views.
	2.	Construct a primary auxiliary view using CAD.
<b>Unit 11: Pictorial Drawings</b>		
	1.	Identify and describe the different types of pictorial drawings.
	2.	Construct and analyze pictorial drawings.
	3.	Construct an isometric drawing on the CAD system.
<b>Unit 12: Machine Drafting</b>		
	1.	Identify terms and symbols associated with machining and manufacturing processes.
	2.	Identify thread forms and representations of threads and fasteners.
	3.	Produce an assembly drawing.
<b>Unit 13: Orientation and Safety</b>		
	1.	Review and demonstrate understanding of local program requirements.
	2.	Review leadership skills and personal development opportunities provided to students by student organizations, including SkillsUSA and TSA.
	3.	Review and research career opportunities, earnings, and educational requirements in the architecture industry.

<b>Unit 14: Architectural Drafting Math (Ongoing throughout the year)</b>		
	1.	Calculate linear measurements.
	2.	Read and interpret the architect and engineering scale.
	3.	Calculate residential square footage.
	4.	Calculate and apply spatial requirements for residential design.
	5.	Estimate residential cost based on specified cost per square foot.
	6.	Discuss industry material sizes (e.g., nominal size vs. actual size of wood members, linear feet, cubic yards, etc.).
<b>Unit 15: Residential Architectural Drafting I</b>		
	1.	Perform all necessary calculations, apply spatial and local code requirements, and estimate the cost of a residential floor plan design
	2.	Produce sketches in planning the three main residential areas.
	3.	Produce an architecturally correct floor plan.
<b>Unit 16: Residential Architectural Drafting II</b>		
	1.	Calculate all necessary measurements, interpreting the architecture and engineering scale, and apply those and local code requirements to exterior elevation and electrical plan designs.
	2.	Draw and note exterior elevations.
	3.	Produce an electrical plan.
<b>Unit 17: Residential Architectural Drafting III</b>		
	1.	Perform all necessary calculations, apply spatial and local code requirements, and estimate the cost of various residential designs, including those of an exterior wall section, foundation plan, plot/site plan, plumbing and HVAC plans.
	2.	Draw, dimension, and label an exterior wall section.
	3.	Produce an architecturally correct foundation plan.
	4.	Develop a residential plot/site plan.
	5.	Discuss plumbing and HVAC plans.



# Appendix A: Industry Standards—ADDA

## ADDA International

	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
<b>Architectural Apprentice Drafter</b>																			
PDC		X												X					
DEM				X			X												
ASO				X		X	X	X			X								
LLT				X	X		X	X	X		X	X							
MAG				X		X		X	X	X	X	X	X		X	X	X	X	X
APS								X			X	X							
LIT												X				X	X	X	
INM				X		X	X	X	X		X								
DAN									X		X	X					X	X	
FPL																			
HPE																	X	X	
RPI																X			
ELE																X			
FFP																X			
FPL										X						X			
SSS																X			
BCG																X	X	X	
SDW																X			
ESC															X				
DBM															X				
<b>Mechanical Apprentice Drafter</b>																			
ATI				X		X	X	X	X	X	X	X	X			X	X	X	
DMR				X		X										X	X	X	
SLG					X	X	X									X	X	X	
DAN								X	X	X	X		X			X	X	X	
OPI							X										X	X	
GCD						X													
GDT									X				X						
MAG							X	X	X	X	X	X	X		X	X	X	X	X
DIN						X	X	X		X	X	X	X			X	X	X	X
PDC		X																	
MVC																			
SEV																			
AUV																			
PIC																			
BWS												X							

### Architectural Apprentice Drafter \*

PDC Professional Drafting Practices in the Workplace – Communications  
 DEM Drafting Equipment – Media – Reproduction  
 ASO Architectural Sketching – Orthographic Projections & Sheets

LLT	Lines – Lettering – General Terminology
MAG	Mathematics and Geometry
APS	Architectural Products – Styles – History – Identification and Terminology
LIT	Building & Site Layout – Identifications and Terminology
INM	Drawing Identification – Architectural Numbering – Drawing Management
DAN	Dimensioning and Notations
FPL	Floor Plan Layout – Relationships – Identification and Terminology
HPE	HVAC – Plumbing – Electrical Plans – Identification and Terminology
RPI	Roof Plans – Identification and Terminology
ELE	Elevations- Identification and related Terminology
FFP	Framing – Framing Plans – Identification and Terminology
FPI	Foundation Plans – Identification and Terminology
SSS	Sections & Stairs and Steps Identification - Terminology
BCG	Building Codes – Regulations, Governing Bodies Organizations
SDW	Schedules – Doors – Windows – Finishes
ESC	Estimations – Specifications – Project Calculations
DBM	Definitions and Building Materials

### **Mechanical Apprentice Drafter \***

ATI	Abbreviations – Terms – Identification
DMR	Drafting Equipment – Media – Reproduction
SLG	Shapes – Lettering – Geometric Symbology
DAN	Dimensioning and Notations
OPI	Orthographic Projections – Identification and Terminology
GCD	Geometric Construction and Descriptive Geometry
MVC	Multiview - Castings
SEV	Sectional Views
AUV	Auxiliary Views
PIC	Pictorials
BWS	Basic Welding – Symbols
GDT	Basic Tolerancing – GD&T
MAG	Basic Math– Drafting Math – Geometry
DIN	Drawing Implementation – Identification – Numbering – Drawing Management

## Appendix B: Industry Standards—AutoCAD

### Autodesk Certified User: AutoCAD

	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Standard																		
ABD					X	X	X	X	X	X	X	X		X	X	X	X	X
DRO					X	X	X	X	X	X	X	X		X	X	X	X	X
DWA					X	X	X	X	X	X	X	X		X	X	X	X	X
MOO					X	X	X	X	X	X	X	X		X	X	X	X	X
UAD					X	X	X	X	X	X	X	X		X	X	X	X	X
ORO					X	X	X	X	X	X	X	X		X	X	X	X	X
REC					X	X	X	X	X	X	X	X		X	X	X	X	X
AND					X	X	X	X	X	X	X	X		X	X	X	X	X
LAP					X	X	X	X	X	X	X	X		X	X	X	X	X
ABDS					X	X	X	X	X	X	X	X		X	X	X	X	X

ABD	Apply Basic Drawing Skills
DRO	Draw Objects
DWA	Draw with Accuracy
MOO	Modify Objects
UAD	Use Additional Drawing Techniques
ORO	Organize Objects
REC	Reuse Existing Content
AND	Annotate Drawings
LAP	Layouts and Printing
ABDS	Apply Basic Drawing Skills







## 2022 Furniture Design & Manufacturing

Program CIP: 48.0702—Furniture Design & Manufacturing

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Research and Curriculum Unit  
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Mississippi State, MS 39762

The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE furniture design and manufacturing is aligned to the following:

## **National Center for Construction Education and Research (NCCER) Learning Series**

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## **Common Career Technical Core Standards for the Manufacturing Career Cluster**

The Common Career Technical Core (CCTC) is a set of high quality and rigorous standards for Career and Technical Education (CTE). There are 16 career clusters with corresponding pathways that describe student knowledge and skill upon completion of the chosen pathway as well as career practices that apply to all pathways within the cluster.

[careertech.org/manufacturing](http://careertech.org/manufacturing)

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oae/college-and-career-readiness-standards](http://mdek12.org/oae/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. *21 Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

# Preface

---

Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

---

## Pathway Description

Furniture design and manufacturing is an instructional program designed to provide entry-level skills for students to become employed in the industry of upholstered furniture making, including skills in operation and care of tools, furniture styles, frame making, upholstery, sewing, and basic educational skills that are essential to the successful performance in this industry.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
  2. C or higher in high school-level math (last course taken, or the instructor can specify the level of math instruction needed)
  3. Instructor approval and TABE reading score (eighth grade or higher)
- or**
1. TABE reading and math score (eighth grade or higher)
  2. Instructor approval
- or**
1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Teacher Licensure

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

## Professional Learning

If you have specific questions about the content of any of the training sessions provided, please contact the RCU at 662.325.2510.

# Course Outlines

---

## Option 1—Four 1-Carnegie Unit Courses

This curriculum consists of four 1-credit courses, which should be completed in the following sequence:

1. **Furniture Design and Manufacturing I—Course Code: 993502**
2. **Furniture Design and Manufacturing II—Course Code: 993503**
3. **Furniture Design and Manufacturing III—Course Code: 993504**
4. **Furniture Design and Manufacturing IV—Course Code: 993505**

### **Course Description: Furniture Design and Manufacturing I**

This course is an introduction to furniture manufacturing. Topics covered include safety, tool, and equipment; math, drawings, and materials handling. This course is requisite to Furniture Design and Manufacturing II.

### **Course Description: Furniture Design and Manufacturing II**

This course is a continuation of Furniture Design and Manufacturing I. Topics covered include measuring, laying out, and cutting fabrics; sewing procedures; patterns, and layouts; cutting and assembling frames, and furniture upholstery. This course is requisite to Furniture Design and Manufacturing III.

### **Course Description: Furniture Design and Manufacturing III**

This course is a continuation of Furniture Design and Manufacturing II. Topics covered include furniture padding, hardware, and support system components; advanced furniture frame patterns and layout; cutting and assembling frames; and measuring, laying out, and cutting fabrics. This course is requisite to Furniture Design and Manufacturing IV.

### **Course Description: Furniture Design and Manufacturing IV**

This course is a continuation of Furniture Design and Manufacturing III. Topics include applying a working drawing and preparing a bill of materials.

**Furniture Design and Manufacturing I—Course Code: 993502**

Unit	Unit Name	Hours
1	Introduction to Furniture Manufacturing	7
2	Employability Skills	8
3	Fundamentals of Student Organizations	5
4	Communication Skills	8
5	Basic Safety	35
6	Introduction to Construction Math	25
7	Hand Tools	11
8	Power Tools	11
9	Introduction to Construction Drawings	20
10	Introduction to Materials Handling	10
<b>Total</b>		<b>140</b>

**Furniture Design and Manufacturing II—Course Code: 993503**

Unit	Unit Name	Hours
11	Furniture Frame Patterns and Layout I	25
12	Cutting and Assembling Frames I	25
13	Measuring, Laying Out, and Cutting Fabric I	25
14	Sewing Procedures I	25
15	Furniture Upholstering I	40
<b>Total</b>		<b>140</b>

**Furniture Design and Manufacturing III—Course Code: 993504**

Unit	Unit Name	Hours
16	Orientation and Safety	10
17	Tool and Equipment Identification and Use	30
18	Measurement	20
19	Furniture Padding, Hardware, and Support System Components	20
20	Furniture Frame Patterns and Layout II	30
21	Cutting and Assembling Frames II	30
<b>Total</b>		<b>140</b>

**Furniture Design and Manufacturing IV—Course Code: 993505**

Unit	Unit Name	Hours
22	Computerized Numerical Control	20
23	Measuring, Laying Out, and Cutting Fabric II	35
24	Sewing Procedures II	35
25	Furniture Upholstery II	50
<b>Total</b>		<b>140</b>

## Option 2—Two 2-Carnegie Unit Courses

This curriculum consists of two 2-credit courses, which should be completed in the following sequence:

1. **Furniture Manufacturing & Upholstery I—Course Code: 993500**
2. **Furniture Manufacturing & Upholstery II—Course Code: 993501**

### Course Description: Furniture Manufacturing & Upholstery I

This course is the entry level course of the secondary furniture manufacturing & upholstering program. Students in this course will gain foundation competencies related to orientation, safety, and leadership; tool and equipment identification and use; measurement, furniture frame patterns, and layout; and cutting and assembling frames in furniture manufacturing and upholstery. This course is a prerequisite to Furniture Manufacturing and Upholstery II.

### Course Description: Furniture Manufacturing & Upholstery II

This course is the upper-level course of the secondary furniture manufacturing & upholstering program. Students in this course will gain additional skills related to upholstery tools; furniture padding, hardware, and support system components; measurement, layout, cutting of fabrics, sewing procedures, and upholstery in furniture manufacturing.

### Furniture Manufacturing & Upholstery I—Course Code: 993500

Unit	Unit Name	Hours
1	Introduction to Furniture Manufacturing	7
2	Employability Skills	8
3	Fundamentals of Student Organizations	5
4	Communication Skills	8
5	Basic Safety	35
6	Introduction to Construction Math	25
7	Hand Tools	11
8	Power Tools	11
9	Introduction to Construction Drawings	20
10	Introduction to Materials Handling	10
11	Furniture Frame Patterns and Layout I	25
12	Cutting and Assembling Frames I	25
13	Measuring, Laying Out, and Cutting Fabric I	25
14	Sewing Procedures I	25
15	Furniture Upholstery I	40
<b>Total</b>		<b>280</b>



**Furniture Manufacturing & Upholstery II—Course Code: 993501**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
16	Orientation and Safety	10
17	Tool and Equipment Identification and Use	30
18	Measurement	20
19	Furniture Padding, Hardware, and Support System Components	20
20	Furniture Frame Patterns and Layout II	30
21	Cutting and Assembling Frames II	30
22	Computerized Numerical Control	20
23	Measuring, Laying Out, and Cutting Fabric II	35
24	Sewing Procedures II	35
25	Furniture Upholstery II	50
<b>Total</b>		<b>280</b>

# Career Pathway Outlook

---

## Overview

Manufacturing is a vital industry in Mississippi, and manufacturing jobs in the state are projected to remain stable over the next ten years. Manufacturing in general employs nearly 12 percent of the workforce in the state. Furniture manufacturing, the second largest manufacturing industry in Mississippi, accounts for over 18,000 jobs (MDES, 2016). Other countries, such as China, regard furniture products made in the U.S. as being of the highest quality, thus providing Mississippi furniture manufacturers an opportunity to develop export markets and expand export sales (Franklin Furniture Institute of Mississippi State University, 2013). North Mississippi has the highest concentration of furniture manufacturers in the state (Seddon, 2014).

## Needs of the Future Workforce

Furniture manufacturing jobs in the United States are expected to decrease over the next 10 years; however, most furniture manufacturing jobs in Mississippi are expected to remain stable or increase, except for finishers.

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2020
Upholsterers	260	290	30	11.5%	\$15.07
Furniture Finishers	20	10	-10	-50%	\$14.66
Cabinetmakers and Bench Carpenters	60	60	0	0%	\$13.25
Textile, Apparel, and Furnishings Workers, All Other	620	700	80	12.9%	N/A
Carpenters	3,610	3,710	100	2.8%	\$18.53
First-Line Supervisors of Production and Operating Workers	7,140	7,640	500	7%	\$28.85

Source: Mississippi Department of Employment Security; mdes.ms.gov (2020).

## Perkins V Requirements and Academic Infusion

The furniture design and manufacturing curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in design and manufacturing fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for furniture design and manufacturing careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

## Transition to Postsecondary Education

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

## **Best Practices**

### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today’s digital learners through applicable and modern practices. The furniture design and manufacturing educator’s goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students’ background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the furniture design and manufacturing curriculum. SkillsUSA is an example of a student organization with many outlets for furniture design and manufacturing. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of design and manufacturing careers and scholarship opportunities.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the furniture design and manufacturing curriculum for group work. To function in today’s workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The furniture design and manufacturing curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the furniture design and manufacturing curriculum that will allow and encourage collaboration with professionals currently in the furniture design and manufacturing field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the furniture design and manufacturing classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and industry professionals. Thus, supervised collaboration and immersion into the industry around the students are keys to students’ success, knowledge, and skills development.

# Professional Organizations

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Association for Career and Technical Education (ACTE)  
[acteonline.org](http://acteonline.org)

SkillsUSA  
[skillsusa.org](http://skillsusa.org)

# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the furniture design and manufacturing program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the furniture design and manufacturing program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Introduction to Furniture Manufacturing

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Competencies and Suggested Objectives
1. Explain the local school rules and regulations. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Describe local school rules found in the student handbook.</li><li>Describe the shop and facilities requirements.</li></ol>
<b>Note:</b> This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

## Unit 2: Employability Skills

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<b>Competencies and Suggested Objectives</b>	
1. Describe employment opportunities in the construction industry. <sup>DOK1</sup>	
a. Describe employment opportunities, including potential earnings, employee benefits, job availability, working conditions, educational requirements, required technology skills, and continuing education/training.	
b. Discuss the guidelines for developing a proper résumé.	
c. Demonstrate completing job applications.	
2. Examine the Mississippi Department of Employment Security (MDES) website and its applications relating to employment opportunities. <sup>DOK1</sup>	
a. Perform various searches through the MDES website, such as:	
• Number of jobs available for a specific area of expertise	
• Hourly wage	
• Percentage of jobs in the county	
• Percentage of jobs in the state	
3. Demonstrate appropriate interviewing skills. <sup>DOK1</sup>	
a. Identify interviewing skills such as speaking, dress, professionalism, and punctuality.	
b. Simulate a job interview.	
4. Describe basic employee responsibilities and appropriate work ethics. <sup>DOK1</sup>	
a. Compare and contrast employment responsibilities and expectations to local school and program policies and expectations.	
b. Define effective relationship skills.	
c. Describe workplace issues, including, but not limited to, sexual harassment, stress, and substance abuse.	

## Unit 3: Fundamentals of Student Organizations

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<b>Competencies and Suggested Objectives</b>	
1. Discuss the history, mission, and purpose of student organizations, including SkillsUSA. <sup>DOK1</sup>	<ol style="list-style-type: none"> <li>a. Trace the history of the program area's student organization.</li> <li>b. Identify the mission, purpose, and/or goals of the program area's student organization.</li> </ol>
2. Explore the advantages of membership in a student organization. <sup>DOK1</sup>	<ol style="list-style-type: none"> <li>a. Discuss the membership process for the program area's student organization.</li> <li>b. Explain the activities related to the local chapter and the state and national organizations.</li> </ol>
3. Discuss the organization's brand resources. <sup>DOK1</sup>	<ol style="list-style-type: none"> <li>a. Identify the motto, creed, and/or pledge and discuss their meanings.</li> <li>b. Recognize related brand resources, such as: <ul style="list-style-type: none"> <li>• Emblem</li> <li>• Colors</li> <li>• Official attire</li> <li>• Logos</li> <li>• Graphic standards</li> </ul> </li> </ol>
4. Describe the importance of effective communication skills. <sup>DOK1</sup>	<ol style="list-style-type: none"> <li>a. Demonstrate verbal and nonverbal communication skills.</li> <li>b. Apply appropriate speaking and listening skills to class- and work-related situations.</li> </ol>
5. Apply leadership skills to class- and work-related situations and 21st century skills. <sup>DOK2</sup>	<ol style="list-style-type: none"> <li>a. Define leadership.</li> <li>b. Discuss the attributes of a leader.</li> <li>c. Identify the roles a leader can assume.</li> </ol>
6. Utilize team-building skills in class- and work-related situations. <sup>DOK2</sup>	<ol style="list-style-type: none"> <li>a. Define team-building.</li> <li>b. Discuss the attributes of a team.</li> <li>c. Identify the roles included in a team.</li> </ol>
7. Discuss the various competitions offered through the program area's student organization. <sup>DOK1</sup>	<ol style="list-style-type: none"> <li>a. Describe each of the competitions and the skills needed to accomplish the tasks.</li> <li>b. Perform the tasks needed to complete an assigned requirement for a competition.</li> </ol>
<b>Note:</b> This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.	



## Unit 4: Communication Skills

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<b>Competencies and Suggested Objectives</b>
1. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Follow basic written and verbal instructions.</li><li>Effectively communicate in on-the-job situations using verbal, written, or electronic communication.</li></ol>
2. Discuss the importance of good listening skills in on-the-job situations. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Apply the tips for developing good listening skills.</li></ol>

## Unit 5: Basic Safety

<b>Competencies and Suggested Objectives</b>	
1.	Describe, define, and illustrate general safety rules for working in a shop/lab and how they relate to the construction industry. <sup>DOK2</sup> <ol style="list-style-type: none"> <li>Describe how to avoid on-site accidents.</li> <li>Explain the relationship between housekeeping and safety.</li> <li>Explain the importance of following all safety rules and company safety policies according to OSHA standards.</li> <li>Explain the importance of reporting all on-the-job injuries, accidents, and near misses.</li> <li>Explain the need for evacuation policies and the importance of following them.</li> <li>Explain the causes of accidents and the impact of accident costs.</li> <li>Compare and contrast shop/lab safety rules to industry safety rules.</li> </ol>
2.	Identify and apply safety around welding operations. <sup>DOK1</sup> <ol style="list-style-type: none"> <li>Use proper safety practices when welding or working around welding operations.</li> <li>Use proper safety practices when welding in or near trenches and excavations.</li> <li>Explain the term “proximity work.”</li> </ol>
3.	Display appropriate safety precautions to take around common jobsite hazards. <sup>DOK1</sup> <ol style="list-style-type: none"> <li>Explain the safety requirements for working in confined areas.</li> <li>Explain the different barriers and barricades and how they are used.</li> </ol>
4.	Demonstrate the appropriate use and care of personal protective equipment (PPE). <sup>DOK1</sup> <ol style="list-style-type: none"> <li>Identify commonly used PPE items.</li> <li>Understand proper use of PPE.</li> <li>Demonstrate appropriate care for PPE.</li> </ol>
5.	Explain fall protection and ladder, stair, and scaffold procedures and requirements. <sup>DOK1</sup> <ol style="list-style-type: none"> <li>Explain the use of proper fall protection.</li> <li>Inspect and safely work with various ladders, stairs, and scaffolds.</li> </ol>
6.	Explain the safety data sheet (SDS). <sup>DOK1</sup> <ol style="list-style-type: none"> <li>Explain the function of the SDS.</li> <li>Interpret the requirements of the SDS.</li> <li>Discuss hazardous material exposures.</li> </ol>
7.	Display appropriate safety procedures related to fires. <sup>DOK1</sup> <ol style="list-style-type: none"> <li>Explain the process by which fires start.</li> <li>Explain fire prevention of various flammable liquids.</li> <li>Explain the classes of fire and the types of extinguishers.</li> <li>Illustrate the proper steps to follow when using a fire extinguisher.</li> <li>Demonstrate the proper techniques for putting out a fire.</li> </ol>
8.	Explain safety in and around electrical situations. <sup>DOK1</sup> <ol style="list-style-type: none"> <li>Explain the injuries that can result when electrical contact occurs.</li> <li>Explain safety around electrical hazards.</li> <li>Explain actions to take when an electrical shock occurs.</li> </ol>
<p><b>Note:</b> Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student’s file.</p>	

## Unit 6: Introduction to Construction Math

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### Competencies and Suggested Objectives

1. Apply the four basic math skills using whole numbers, fractions, decimals, and percentages, both with and without a calculator. <sup>DOK2</sup>
  - a. Define basic geometric shapes used in the construction industry.
  - b. Add, subtract, multiply, and divide whole numbers, decimals, and fractions with and without a calculator.
  - c. Convert whole numbers to fractions and convert fractions to whole numbers.
  - d. Convert decimals to percentages and convert percentages to decimals.
  - e. Convert fractions to decimals.
  - f. Convert fractions to percentages.
  - g. Demonstrate reading a standard and metric ruler and a tape measure.
  - h. Recognize and use metric units of length, weight, volume, and temperature.

# Unit 7: Hand Tools

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Demonstrate the use and maintenance of hand tools. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify, visually inspect, and discuss the safe use of common hand tools.</li><li>b. Discuss safety rules.</li><li>c. Select and demonstrate the use of hand tools.</li><li>d. Explain the procedures for maintenance.</li></ol></li></ol>

## Unit 8: Power Tools

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Demonstrate the use and maintenance of power tools. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify, visually inspect, and discuss the safe use of common power tools.</li><li>b. Discuss safety rules.</li><li>c. Select and demonstrate the use of power tools.</li><li>d. Explain the procedures for maintenance.</li></ol></li></ol>

## Unit 9: Introduction to Construction Drawings

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Read, analyze, and understand basic components of a drawing. <sup>DOK3</sup><ol style="list-style-type: none"><li>a. Recognize and identify terms, components, and symbols commonly used on drawings.</li><li>b. Relate information on construction drawings to actual locations on the drawings.</li><li>c. Recognize different types of drawings.</li><li>d. Interpret and use drawing dimensions.</li></ol></li></ol>

# Unit 10: Introduction to Materials Handling

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Safely handle and store materials. <sup>DOK1</sup><ol style="list-style-type: none"><li>a. Define a load.</li><li>b. Establish a pre-task plan prior to moving a load.</li><li>c. Demonstrate proper materials-handling techniques.</li><li>d. Choose the appropriate materials-handling equipment for a task.</li><li>e. Recognize hazards and follow safety procedures required for materials handling.</li><li>f. Identify and demonstrate commonly used knots.</li></ol></li></ol>

## Unit 11 Furniture Frame Patterns I

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<b>Competencies and Suggested Objectives</b>	
1. Identify terms and materials commonly used in frame manufacturing. <sup>DOK1</sup>	
a. Define terms associated with frame patterns.	
b. Identify woods to use in different applications on frames.	
2. Identify types and styles of upholstered furniture. <sup>DOK1</sup>	
a. Describe types of furniture.	
b. Describe the most common furniture styles.	
3. Create a working drawing. <sup>DOK3</sup>	
a. Read a working drawing, including dimensions and different features.	
b. Develop a working drawing, including concept and dimensions, manually or by using a computer.	



## Unit 12: Cutting and Assembling Frames I

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<b>Competencies and Suggested Objectives</b>
1. Cut frames for upholstered furniture to specifications. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Cut parts to length using the miter saw.</li><li>Cut parts to width using the table saw.</li><li>Perform scroll cuts using the bandsaw.</li><li>Drill holes for dowel pins with the drill press.</li></ol>
2. Assemble frame parts to specifications using fastening devices. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Assemble chair frames.</li><li>Assemble ottoman/foot-stool frames.</li><li>Assemble slipper bench frames.</li></ol>

# Unit 13: Measuring, Laying Out, and Cutting Fabric I

<b>Competencies and Suggested Objectives</b>	
1. Identify parts of furniture being manufactured. <sup>DOK1</sup>	a. Identify parts of upholstered furniture, including front seat, bottom band, inside arm, inside back, back band, outside arm, outside back, and skirt.
2. Measure parts of furniture. <sup>DOK2</sup>	a. Measure parts of furniture with instruments or gauges to ensure compliance with specifications.
3. Apply fabric-cutting procedures. <sup>DOK2</sup>	a. Lay out fabric. b. Cut the fabric following the required steps.

# Unit 14: Sewing Procedures I

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<b>Competencies and Suggested Objectives</b>
1. Identify types and basic parts of sewing machines. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Identify types of sewing machines.</li><li>Identify basic parts of a sewing machine.</li><li>Describe each part of a sewing machine and the tasks they perform.</li></ol>
2. Operate a sewing machine. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Thread a sewing machine.</li><li>Perform a sewing procedure, including sewing pull, welting, zippers, dart, and corner.</li><li>Observe the maintenance procedures for a sewing machine, according to manufacturer's specifications.</li></ol>

# Unit 15: Furniture Upholstery I

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<b>Competencies and Suggested Objectives</b>	
1. Identify the steps in furniture upholstery. <sup>DOK1</sup>	<ul style="list-style-type: none"><li>a. Identify the steps in basic seat construction.</li><li>b. Identify the steps in basic arm construction.</li><li>c. Identify the steps in basic back construction.</li><li>d. Identify the steps in basic outside trim construction.</li></ul>
2. Perform the steps in furniture upholstery. <sup>DOK2</sup>	<ul style="list-style-type: none"><li>a. Perform the steps in basic seat construction.</li><li>b. Perform the steps in basic arm construction.</li><li>c. Perform the steps in basic back construction.</li><li>d. Perform the steps in basic outside trim construction.</li></ul>

## Unit 16: Orientation and Safety Review

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<b>Competencies and Suggested Objectives</b>	
1. Review and explain the local school rules and regulations. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>Describe local school rules found in the student handbook.</li><li>Describe the shop and facilities requirements.</li></ol>
2. Review and describe SkillsUSA activities pertaining to furniture manufacturing. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>Describe the purposes of the SkillsUSA organization.</li><li>Describe the leadership development activities of SkillsUSA.</li><li>Describe the personal development activities associated with SkillsUSA.</li></ol>
3. Review the safety requirements for upholstered manufacturing. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>Describe personal safety rules for working in a shop/lab and industry, including OSHA regulations.</li><li>Describe the general workplace safety rules.</li><li>Describe the proper use of fire extinguishers and classes of fires.</li><li>Identify standard industry Safety Color-Coding System.</li><li>Describe procedures for safely handling heavy objects.</li><li>Describe accident-reporting procedures.</li></ol>
4. Review hazardous materials that may be found on a job site and describe procedures for handling, avoidance, or removal of materials. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>Review and interpret an SDS.</li></ol>

**Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

## Unit 17: Tool and Equipment Identification and Use

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<b>Competencies and Suggested Objectives</b>	
1. Demonstrate the use of hand tools found in upholstered furniture manufacturing. <sup>DOK2</sup>	
a. Identify hand tools used in frame building.	
b. Demonstrate use of hand tools used in frame building.	
2. Demonstrate the use of power tools in upholstered furniture frame manufacturing. <sup>DOK2</sup>	
a. Identify types of air-powered fasteners used in furniture manufacturing.	
b. Demonstrate the use of air-powered fasteners used in furniture manufacturing.	
c. Identify power tools used in frame building.	
d. Demonstrate the use of power tools used in frame building.	
e. Identify machines used in frame building.	
f. Describe the operation of machines used in frame building.	
g. Describe the safety rules of each machine used in frame building.	
h. Demonstrate the use of each machine used in frame building.	
i. Perform maintenance procedures on each machine used in frame building.	
3. Identify furniture upholstery tools and fasteners. <sup>DOK1</sup>	
a. Identify types of hammers used in upholstery work.	
b. Identify types of upholstery needles.	
c. Identify types of stuffing devices.	
d. Identify staple fasteners.	
e. Identify cutting devices.	
4. Demonstrate the safe use of furniture upholstery tools. <sup>DOK2</sup>	
a. Demonstrate the safe use of upholstery hammers.	
b. Demonstrate the safe use of upholstery needles.	
c. Demonstrate the safe use of upholstery stuffing devices.	
d. Demonstrate the safe use of upholstery staple fasteners.	
e. Demonstrate the safe use of upholstery cutting devices.	

# Unit 18: Measurement

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<b>Competencies and Suggested Objectives</b>
1. Identify types of measuring devices used in furniture manufacturing. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Identify types of measuring devices used in furniture manufacturing, including tape measure, rule, square, and compass.</li><li>Demonstrate ability to use types of measuring devices used in furniture manufacturing, including tape measure, rule, square, and compass.</li></ol>
2. Perform mathematics essential to furniture manufacturing occupations. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Calculate fractions, including addition, subtraction, multiplication, and division.</li><li>Calculate board feet measurements in lumber.</li></ol>

# Unit 19: Furniture Padding, Hardware, and Support System Components

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<b>Competencies and Suggested Objectives</b>	
1. Identify padding and hardware components used in upholstered furniture manufacturing. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Describe types of furniture padding and hardware components used in upholstery work.</li><li>b. Describe factors upon which seating comfort depends, including foam density and spring gauge.</li><li>c. Compare the properties of padding materials used in upholstered furniture.</li></ol>
2. Apply support system components. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Determine the type of springs or support system to be used.</li><li>b. Install support system components.</li></ol>
3. Apply upholstered furniture padding. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Determine the type of padding to be used.</li><li>b. Transfer the measurements from pattern to padding, according to specifications.</li><li>c. Cut padding, according to specifications.</li><li>d. Apply padding to frame and fasten according to specifications.</li></ol>
4. Prepare a bill of materials for the padding, hardware, and support system of a sofa. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Itemize the materials.</li><li>b. Determine quantities.</li><li>c. Determine costs.</li><li>d. Evaluate cost efficiency of materials by comparison.</li></ol>



## Unit 20: Furniture Frame Patterns and Layout II

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<b>Competencies and Suggested Objectives</b>
1. Use a working drawing to lay out and cut materials for a frame. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Demonstrate the process of laying out patterns for the greatest yield.</li><li>Demonstrate the process of laying out patterns and duplicating parts, manually or on a computer.</li></ol>
2. Prepare a bill of materials for the manufacture of a furniture frame. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Itemize the materials and supplies.</li><li>Determine quantities.</li><li>Determine costs.</li></ol>

## Unit 21: Cutting and Assembling Frames II

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<b>Competencies and Suggested Objectives</b>
1. Cut frames for upholstered furniture to specifications. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Cut parts to length using the miter saw.</li><li>Cut parts to width using the table saw.</li><li>Perform scroll cuts using the bandsaw.</li><li>Drill holes for dowel pins with the drill press (reference Unit 7).</li></ol>
2. Assemble frame parts to specifications using fastening devices. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Assemble sofa and chair frames.</li></ol>

## Unit 22: Computerized Numerical Control

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<b>Competencies and Suggested Objectives</b>
1. Describe computerized numerical control (CNC), including the codes and the input of a pre-written program. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Describe the operations of CNC.</li><li>Describe codes used in a CNC machine.</li></ol>
2. Safely operate a CNC machine. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Download the program.</li><li>Execute the program.</li></ol>

## Unit 23: Measuring, Laying Out, and Cutting Fabric II

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Competencies and Suggested Objectives
1. Identify parts of furniture being manufactured. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Identify parts of upholstered furniture, including front seat, bottom band, inside arm, inside back, back band, outside arm, outside back, and skirt.</li><li>Measure parts of furniture.</li></ol>
2. Apply fabric-cutting procedures. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Develop a manual or computerized pattern for part layout.</li><li>Lay out fabric.</li><li>Cut the fabric following the required steps.</li><li>Observe automated fabric cutting equipment.</li></ol>

## Unit 24: Sewing Procedures II

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<b>Competencies and Suggested Objectives</b>	
1. Identify types and basic parts of sewing machines. <sup>DOK1</sup>	<ol style="list-style-type: none"><li>a. Identify types of sewing machines.</li><li>b. Identify basic parts of a sewing machine.</li><li>c. Describe each part of a sewing machine and the task it performs.</li></ol>
2. Operate a sewing machine. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Thread a sewing machine.</li><li>b. Perform a sewing procedure, including sewing pull, welting, boxing, zippers, dart, pleat, and corner.</li><li>c. Demonstrate the maintenance procedures for a sewing machine, according to manufacturer's specifications.</li></ol>
3. Create a sew drawing. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Create a sew drawing for upholstered furniture, either manually or using a computer.</li></ol>

## Unit 25: Furniture Upholstery II

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Competencies and Suggested Objectives
1. Identify the steps in furniture upholstery. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Identify the steps in advanced seat construction.</li><li>Identify the steps in advanced arm construction.</li><li>Identify the steps in advanced back construction.</li><li>Identify the steps in advanced outside trim construction.</li></ol>
2. Perform the steps in furniture upholstery. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Perform the steps in advanced seat construction.</li><li>Perform the steps in advanced arm construction.</li><li>Perform the steps in advanced back construction.</li><li>Perform the steps in advanced outside trim construction.</li></ol>

# Student Competency Profile

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Student's Name: \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

<b>Unit 1: Introduction to Furniture Manufacturing</b>		
	1.	Explain the local school rules and regulations.
	2.	Explain the opportunities, requirements, and working conditions for employment in the upholstered furniture manufacturing industry.
<b>Unit 2: Employability Skills</b>		
	1.	Describe employment opportunities in the construction industry.
	2.	Examine the Mississippi Department of Employment Security (MDES) website and its applications relating to employment opportunities.
	3.	Demonstrate appropriate interviewing skills.
	4.	Describe basic employee responsibilities and appropriate work ethics.
<b>Unit 3: Fundamentals of Student Organizations</b>		
	1.	Discuss the history, mission, and purpose of student organizations, including SkillsUSA.
	2.	Explore the advantages of membership in a student organization.
	3.	Discuss the organization's brand resources.
	4.	Describe the importance of effective communication skills.
	5.	Apply leadership skills to class- and work-related situations and 21st century skills.
	6.	Utilize team-building skills in class- and work-related situations.
	7.	Discuss the various competitions offered through the program area's student organization.
<b>Unit 4: Communication Skills</b>		
	1.	Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.
	2.	Discuss the importance of good listening skills in on-the-job situations.

<b>Unit 5: Basic Safety</b>		
	1.	Describe, define, and illustrate general safety rules for working in a shop/lab and how they relate to the construction industry.
	2.	Identify and apply safety around welding operations.
	3.	Display appropriate safety precautions to take around common jobsite hazards.
	4.	Demonstrate the appropriate use and care of personal protective equipment (PPE).
	5.	Explain fall protection, ladder, stair, and scaffold procedures and requirements.
	6.	Explain the safety data sheet (SDS).
	7.	Display appropriate safety procedures related to fires.
	8.	Explain safety in and around electrical situations.
<b>Unit 6: Introduction to Construction Math</b>		
	1.	Apply the four basic math skills using whole numbers, fractions, decimals, and percentages, both with and without a calculator.
<b>Unit 7: Hand Tools</b>		
	1.	Demonstrate the use and maintenance of hand tools.
<b>Unit 8: Power Tools</b>		
	1.	Demonstrate the use and maintenance of power tools.
<b>Unit 9: Introduction to Construction Drawings</b>		
	1.	Read, analyze, and understand basic components of a drawing.
<b>Unit 10: Introduction to Materials Handling</b>		
	1.	Safely handle and store materials.
<b>Unit 11: Furniture Frame Patterns and Layout I</b>		
	1.	Identify terms and materials commonly used in frame manufacturing.
	2.	Identify types and styles of upholstered furniture.
	3.	Create a working drawing.
<b>Unit 12: Cutting and Assembling Frames I</b>		
	1.	Cut frames for upholstered furniture to specifications.
	2.	Assemble frame parts to specifications using fastening devices.



<b>Unit 13: Measuring, Laying Out, and Cutting Fabric I</b>		
	1.	Identify parts of furniture being manufactured.
	2.	Measure parts of furniture.
	3.	Identify fabric-cutting procedures.
<b>Unit 14: Sewing Procedures I</b>		
	1.	Identify types and basic parts of sewing machines.
	2.	Operate a sewing machine.
<b>Unit 15: Furniture Upholstery I</b>		
	1.	Identify the steps in furniture upholstery.
	2.	Perform the steps in furniture upholstery.
<b>Unit 16: Orientation and Safety Review</b>		
	1.	Review and explain the local school rules and regulations.
	2.	Review and describe SkillsUSA activities pertaining to furniture manufacturing.
	3.	Review the safety requirements for upholstered manufacturing.
	4.	Review hazardous materials that may be found on a job site and describe procedures for handling, avoidance, or removal of materials.
<b>Unit 17: Tool and Equipment Identification and Use</b>		
	1.	Demonstrate use of hand tools found in upholstered furniture manufacturing.
	2.	Demonstrate the use of power tools in upholstered furniture frame manufacturing.
	3.	Identify furniture upholstery tools and fasteners.
	4.	Demonstrate the safe use of furniture upholstery tools.
<b>Unit 18: Measurement</b>		
	1.	Identify types of measuring devices used in furniture manufacturing.
	2.	Perform mathematics essential to furniture manufacturing occupations.
	2.	Demonstrate the safe use of furniture upholstery tools.
<b>Unit 19: Furniture Padding, Hardware, and Support System Components</b>		
	1.	Identify padding and hardware components used in upholstered furniture manufacturing.
	2.	Apply support system components.
	3.	Apply upholstered furniture padding.
	4.	Prepare a bill of materials for the padding, hardware, and support system of a sofa.

<b>Unit 20: Furniture Frame Patterns and Layout II</b>		
	1.	Use a working drawing to lay out and cut materials for a frame.
	2.	Prepare a bill of materials for the manufacture of a furniture frame.
<b>Unit 21: Cutting and Assembling Frames II</b>		
	1.	Cut frames for upholstered furniture to specifications.
	2.	Assemble frame parts to specifications using fastening devices.
<b>Unit 22: Computerized Numerical Control</b>		
	1.	Describe computerized numerical control (CNC), including the codes and the input of a pre-written program.
	2.	Safely operate a CNC machine.
<b>Unit 23: Measuring, Laying Out, and Cutting Fabric II</b>		
	1.	Identify parts of furniture being manufactured.
	2.	Apply fabric-cutting procedures.
<b>Unit 24: Sewing Procedures II</b>		
	1.	Identify types and basic parts of sewing machines.
	2.	Operate a sewing machine.
	3.	Create a sew drawing.
<b>Unit 25: Furniture Upholstery II</b>		
	1.	Identify the steps in furniture upholstery.
	2.	Perform the steps in furniture upholstery.

# Appendix A: Industry Standards

## Common Career and Technical Core Standards

<b>Crosswalk for Furniture Design and Manufacturing</b>											
Industry Standards Units 1-10	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
<b>NCCER Core</b>											
BSM						X					
ICM							X				
IHT								X			
IPT									X		
BLU										X	
COM					X						
EMP			X								
IMH											X
<b>Manufacturing</b>											
MN 1		X		X							
MN 2											
MN 3				X							
MN 4		X									
MN 5				X							
MN 6				X							
<b>Production</b>											
MN-PRO 1											
MN-PRO 2				X							
MN-PRO 3											
MN-PRO 4				X							
MN-PRO 5				X							

Industry Standards Units 11-19	Units	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18	Unit 19
<b>Manufacturing</b>										
MN 1										
MN 2		X							X	
MN 3		X	X	X		X	X	X		X
MN 4					X					
MN 5		X	X	X		X	X	X		X
MN 6		X	X	X	X	X	X	X	X	X
<b>Production</b>										
MN-PRO 1					X					
MN-PRO 2		X	X	X	X	X	X	X		X
MN-PRO 3			X	X	X	X			X	X
MN-PRO 4		X	X	X	X	X				X
MN-PRO 5		X	X	X	X	X	X	X		X

Industry Standards Units 11-19	Units	Unit 20	Unit 21	Unit 22	Unit 23	Unit 24	Unit 25			
<b>Manufacturing</b>										
MN 1										
MN 2		X								
MN 3		X	X	X	X	X	X			
MN 4										
MN 5		X	X	X	X	X	X			

MN 6		X	X	X	X	X	X			
Production										
MN-PRO 1				X		X				
MN-PRO 2		X	X	X	X	X	X			
MN-PRO 3			X	X	X	X	X			
MN-PRO 4		X	X	X	X	X	X			
MN-PRO 5		X	X	X	X	X	X			

## NCCER CORE

BSM – BASIC SAFETY (00101-15)

ICM – INTRODUCTION TO CONSTRUCTION MATH (00102-15)

IHT – INTRODUCTION TO HAND TOOLS (00103-15)

IPT – INTRODUCTION TO POWER TOOLS (00104-15)

BLU – INTRODUCTION TO CONSTRUCTION DRAWINGS (00105-15)

COM – BASIC COMMUNICATION SKILLS (00107-15)

EMP – BASIC EMPLOYABILITY SKILLS (00108-15)

IMH – INTRODUCTION TO MATERIALS HANDLING (00109-15)

## Common Career and Technical Core Standards

### Career Cluster Manufacturing

- MN 1 Evaluate the nature and scope of the Manufacturing Career Cluster and the role of manufacturing in society and in the economy.
- MN 2 Analyze and summarize how manufacturing businesses improve performance.
- MN 3 Comply with federal, state, and local regulations to ensure worker safety and health and environmental work practices.
- MN 4 Describe career opportunities and means to achieve those opportunities in each of the Manufacturing Career Pathways.
- MN 5 Describe government policies and industry standards that apply to manufacturing.
- MN 6 Describe the various manufacturing processes.

### Career Cluster Production

- MN-PRO 1 Diagnose production process problems and take corrective action to meet production quality standards.
- MN-PRO 2 Manage safe and healthy production working conditions and environmental risks.

- MN-PRO 3      Make continuous improvement recommendations based on results of production process audits and inspections.
- MN-PRO 4      Coordinate work teams when producing products to enhance production process and performance.
- MN-PRO 5      Demonstrate the safe use of manufacturing equipment.





## 2022 Automotive Service Technician

Program CIP: 47.0604—Automobile/Automotive Mechanic Technology/Technician

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Mississippi State University  
Mississippi State, MS 39762

The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards and alignment crosswalks are referenced in the appendix. Depending on the curriculum, these crosswalks could identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE automotive service technician curriculum is aligned to the following standards:

## **International Society for Technology in Education Standards (ISTE)**

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[iste.org](http://iste.org)

## **College- and Career-Ready Standards**

College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn and so teachers and parents know what they need to do to help them.

[mdek12.org/oe/college-and-career-readiness-standards](http://mdek12.org/oe/college-and-career-readiness-standards)

## **Framework for 21st Century Learning**

In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills. 21 *Framework Definitions* (2019).

[battelleforkids.org/networks/p21/frameworks-resources](http://battelleforkids.org/networks/p21/frameworks-resources)

## **Automotive Service Excellence (ASE), Education Foundation Standards**

The ASE Education Foundation is a nonprofit organization that evaluates and accredits entry-level automotive technology education programs against standards developed by the automotive service industry. It also develops career-readiness education for students that fuse local partnerships, rigorous standard-based education, workplace experience, and mentorship together.

[aseeducationfoundation.org](http://aseeducationfoundation.org)

# Preface

---

Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

# Mississippi Teacher Professional Resources

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The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning

Program resources can be found at the RCU's website, [rcu.msstate.edu](http://rcu.msstate.edu).

Learning Management System: An Online Resource

Learning management system information can be found at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

# Executive Summary

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## Pathway Description

The automotive service technician pathway exposes students to hands-on learning experiences and prepares them for the automobile technician industry. Students will master concepts and skills in safety in the workplace, tools and equipment, engine repair, electrical systems, heating and cooling systems, wheel and tire, and more.

## College, Career, and Certifications

The automotive service technician pathway is designed as a secondary program for preparation to enter the field of automotive maintenance and light repair. The purpose of the course is to prepare students to continue study in a postsecondary automotive repair program or to begin work as an entry-level automotive technician. The automotive units in this curriculum are written to the National Institute for ASE Maintenance and Light Repair (MLR) credentialing standards in conjunction with the ASE Education Foundation.

## Grade Level and Class Size Recommendations

It is recommended that students enter this program as 10th graders. Exceptions to this are a district-level decision based on class size, enrollment numbers, and student maturity. A maximum of 25 students is recommended for classroom-based courses, while a maximum of 15 students is recommended for lab-based courses.

## Student Prerequisites

For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
3. Instructor approval and TABE reading score (eighth grade or higher)

**or**

1. TABE reading and math score (eighth grade or higher)
2. Instructor approval

**or**

1. Instructor approval

## Assessment

The latest assessment blueprint for the curriculum can be found at [rcu.msstate.edu/curriculum/curriculumdownload](http://rcu.msstate.edu/curriculum/curriculumdownload).

## Teacher Licensure

The latest teacher licensure information can be found at [mdek12.org/oel/apply-for-an-educator-license](http://mdek12.org/oel/apply-for-an-educator-license).

## Professional Learning

If you have specific questions about the content of any of training sessions provided, please contact the RCU at 662.325.2510.



# Course Outlines

---

## Option 1—Four 1-Carnegie Unit Courses

This curriculum consists of four 1-credit courses that should be completed in the following sequence:

1. **Automotive Service Fundamentals I—Course Code: 997002**
2. **Automotive Service Fundamentals II—Course Code: 997003**
3. **Automotive Service Fundamentals III—Course Code: 997004**
4. **Automotive Service Fundamentals IV—Course Code: 997005**

### **Course Description: Automotive Service Fundamentals I**

This course contains an introduction to shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. The engine repair unit focuses on the overall internal combustion engine, cylinder and valve train, and lubrication and cooling systems. It also contains an introduction to disc brakes and drum brakes. This is a 1-Carnegie Unit course.

### **Course Description: Automotive Service Fundamentals II**

This course contains an introduction to electrical/electronic information and terminology including electrical/electronic system theory, battery systems, starting systems, and charging systems. The electrical/electronic systems unit contains information on lighting systems, concepts of gauges, warning devices, driver information systems, horn system, wiper/washer system, and accessories system diagnostic repair. This course also includes information for the service and maintenance to the heating, ventilation, and engine cooling system. This 1-Carnegie Unit course should only be taken after students successfully pass Automotive Service Fundamentals I.

### **Course Description: Automotive Service Fundamentals III**

This course contains a review on shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. This course contains general suspension/steering theory; steering system inspection, diagnosis, and repair; concepts of front, rear, and miscellaneous systems; and wheel/tire alignment concepts. The engine performance unit contains information on fuel, air induction, and exhaust systems. This 1-Carnegie Unit course should only be taken after students successfully pass Automotive Service Fundamentals II.

### **Course Description: Automotive Service Fundamentals IV**

This course contains an introduction to both automatic and manual drivetrain. This course also covers axles, related brake systems, antilock brakes, and traction control systems. This 1-Carnegie Unit course should only be taken after students successfully pass Automotive Service Fundamentals III.

**Automotive Service Fundamentals I—Course Code: 997002**

<b>Unit</b>	<b>Unit Title</b>	<b>Hours</b>
1	Orientation	5
2	Workplace Employability Skills	5
3	Automotive Shop and Personal Safety	10
4	Tools and Equipment	10
5	Preparing a Vehicle for Service	5
6	Maintenance	10
7	Wheel and Tire	10
8	Engine Repair	15
9	Engine Cylinder Head and Block	15
10	Cooling System	10
11	General Brakes	10
12	Hydraulic Brake Systems	11
13	Disc Brake Systems	12
14	Drum Brake Systems	12
<b>Total</b>		<b>140</b>

**Automotive Service Fundamentals II—Course Code: 997003**

<b>Unit</b>	<b>Unit Title</b>	<b>Hours</b>
15	Basic Electrical/Electronic Systems	25
16	Battery System	15
17	Starting System	17
18	Charging System	18
19	Body and Lighting Systems	25
20	Automotive Heating, Ventilation, and Air Conditioning (HVAC)	40
<b>Total</b>		<b>140</b>

**Automotive Service Fundamentals III—Course Code: 997004**

<b>Unit</b>	<b>Unit Title</b>	<b>Hours</b>
21	Safety and Workplace Employability Skills Review	15
22	Suspension and Steering Systems Operation	13
23	Steering Systems	15
24	Suspension Systems	15
25	Wheel Alignment	13
26	Engine Performance	15
27	Computerized Controls	13
28	Ignition System	13
29	Fuel, Air Induction, and Exhaust Systems	15
30	Emission Control Systems	13
<b>Total</b>		<b>140</b>

**Automotive Service Fundamentals IV—Course Code: 997005**

<b>Unit</b>	<b>Unit Title</b>	<b>Hours</b>
31	Antilock Brakes and Traction Control	13
32	Power-Assisted Brake Systems	13
33	Related Brake Systems	13
34	Automatic Transmission and Transaxle	15
35	Automatic Transmission and Transaxle Service	15
36	CVT and Hybrid Transmission and Transaxle	13
37	Manual Drivetrain and Axles	15
38	Clutch	13
39	Drive Shaft, Half Shafts, Universal and Constant-Velocity Joints	15
40	Differential and Drive Axles	15
<b>Total</b>		<b>140</b>

## Option 2—Two 2-Carnegie-Unit Courses

This curriculum consists of two 2-credit courses, which should be completed in the following sequence:

1. **Automotive Service Technology I—Course Code: 997000**
2. **Automotive Service Technology II— Course Code: 997001**

### Course Description: Automotive Service Technology I

This course contains an introduction to shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. The engine repair unit focuses on the overall internal combustion engine, cylinder and valve train, lubrication and cooling systems. It also contains an introduction to disc brakes and drum brakes. This course also contains an introduction to electrical/electronic information and terminology including electrical/electronic system theory, battery systems, starting systems, and charging systems. The electrical/electronic systems unit contains information on lighting systems, concepts of gauges, warning devices, driver information systems, horn system, wiper/washer system, and accessories system diagnostic repair. It also includes information for the service and maintenance to the heating, ventilation, and cooling system

### Course Description: Automotive Service Technology II

This course contains a review on shop operations, safety, tools and equipment, and preparing the vehicle for both service and the customer. This course contains general suspension/steering theory; steering system inspection, diagnosis, and repair; concepts of front, rear, and miscellaneous systems; and wheel/tire alignment concepts. The engine performance unit contains information on fuel, air induction, and exhaust systems; concepts of emission control system; and concepts of engine service. This course also contains an introduction to both automatic and manual drivetrains and axles. Related brake systems, antilock brakes, and traction control systems are also taught. The course should be taken after the student has successfully passed Automotive Service Technology I.

### Automotive Service Technology I—Course Code: 997000

Unit	Title	Hours
1	Orientation	5
2	Workplace Employability Skills	5
3	Automotive Shop and Personal Safety	10
4	Tools and Equipment	10
5	Preparing a Vehicle for Service	5
6	Maintenance	10
7	Wheel and Tire	10
8	Engine Repair	15
9	Engine Cylinder Head and Block	15
10	Cooling System	10
11	General Brakes	10
12	Hydraulic Brake Systems	11
13	Disc Brake Systems	12

14	Drum Brake Systems	12
15	Basic Electrical/Electronic Systems	25
16	Battery System	15
17	Starting System	17
18	Charging System	18
19	Body and Lighting Systems	25
20	Automotive Heating, Ventilation, and Air Conditioning (HVAC)	40
<b>Total</b>		<b>280</b>

### Automotive Service Technology II—Course Code: 997001

Unit	Title	Hours
21	Safety and Workplace Employability Skills Review	15
22	Suspension and Steering Systems Operation	13
23	Steering Systems	15
24	Suspension Systems	15
25	Wheel Alignment	13
26	Engine Performance	15
27	Computerized Controls	13
28	Ignition System	13
29	Fuel, Air Induction, and Exhaust Systems	15
30	Emission Control Systems	13
31	Antilock Brakes and Traction Control	13
32	Power-Assisted Brake Systems	13
33	Related Brake Systems	13
34	Automatic Transmission and Transaxle	15
35	Automatic Transmission and Transaxle Service	15
36	CVT and Hybrid Transmission and Transaxle	13
37	Manual Drivetrain and Axles	15
38	Clutch	13
39	Drive Shaft, Half Shafts, Universal and Constant-Velocity Joints	15
40	Differential and Drive Axles	15
<b>Total</b>		<b>280</b>

# Career Pathway Outlook

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## Overview

Data used to develop the automotive service technician pathway were collected from a variety of sources including industry surveys and interviews, occupational employment projections, national standards, the MDE, institutions of higher learning, community and junior college requirements, and state and national certification requirements. The pathway is designed to provide an overview of the automotive service area to prepare students for careers in occupations predicted to have a high number of available jobs in the next 10 years. These jobs are in the automotive service sector. Industry input was collected from automotive service businesses in Mississippi to customize the pathway to meet the needs of the state’s employers. Employment projections were obtained from the Mississippi Economic Review and Outlook, Mississippi Department of Employment Security, and the *National Occupational Outlook Handbook*.

Students who successfully master the curriculum should have the skills required to acquire ASE certification, which is based on industry-validated performance indicators. Students should also be prepared to enter programs for advanced education in the automotive fields. The pathway will articulate to automotive service programs offered in Mississippi’s community and junior colleges.

## Needs of the Future Workforce

Automotive service technician and mechanic occupations are projected to have about slightly less-than-average growth over the projection date in Mississippi with a growth rate of 3.9%. With employers struggling to find qualified applicants, jobseekers who have completed postsecondary training programs in automotive technology will have the best job prospects. This field is growing throughout the U.S., which means there will be job opportunities within the state and across the nation.

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent )	Average Hourly Earnings, 2020
Automotive Service Technician and Mechanics	5,610	5,830	220	3.9	\$18.56

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

## Perkins V Requirements and Academic Infusion

The automotive service technician curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in the automotive field. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for automotive service careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

## **Transition to Postsecondary Education**

The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, [mccb.edu](http://mccb.edu).

### **Best Practices**

#### *Innovative Instructional Technologies*

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The automotive service technician educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

#### *Differentiated Instruction*

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunity to succeed.

#### *CTE Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the automotive service technician curriculum. SkillsUSA is an example of a student organization with many outlets for automotive service. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of automotive service careers and scholarship opportunities.

#### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the automotive service technician curriculum for group work. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The automotive service technician curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the automotive service technician curriculum that will allow and encourage collaboration with professionals currently in the automotive service technician field.

#### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the automotive service technician classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link to all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and industry professionals. Thus, supervised collaboration and immersion into the industry around the students are keys to students' success, knowledge, and skills development.

# Professional Organizations

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Association for Career and Technical Education (ACTE)  
[acteonline.org](http://acteonline.org)

SkillsUSA  
[skillsusa.org](http://skillsusa.org)



# Using This Document

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## **Competencies and Suggested Objectives**

A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

## **Teacher Resources**

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at [rcu.msstate.edu/curriculum/curriculumdownload.aspx](http://rcu.msstate.edu/curriculum/curriculumdownload.aspx). All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future, if they are not already. To be added to the guide, [send a Help Desk ticket to the RCU](#) by emailing [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu).

## **Perkins V Quality Indicators and Enrichment Material**

Some of the units may include an enrichment section at the end. If the automotive service technician program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the automotive service technician program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

# Unit 1: Orientation

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<b>Competencies and Suggested Objectives</b>
1. Describe local program and career and technical center policies and procedures. <sup>DOK1</sup> a. Describe local program and career and technical center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.
2. Describe employment opportunities and responsibilities. <sup>DOK1</sup> a. Describe employment opportunities including potential earnings, employee benefits, job availability, and place of employment, working conditions, and educational requirements. b. Describe basic employee responsibilities. c. Explain automotive industry pay scales including flat rate, salary, and hourly. d. Describe ASE certifications related to the automotive industry.
3. Explore leadership skills and personal development opportunities provided by the student organization SkillsUSA. <sup>DOK2</sup> a. Demonstrate effective team building and leadership skills. b. Practice appropriate work ethics. c. Explain the purpose, mission, objectives, motto, colors, official dress, and other distinguishing characteristics of SkillsUSA. d. Explain how participation in SkillsUSA can promote lifelong responsibility for community service, professional growth, and development. e. Explore the local, state, and national opportunities available to students through participation in SkillsUSA including, but not limited to, conferences, competitions, community service, philanthropy, and other activities.

## Unit 2: Workplace Employability Skills

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### Competencies and Suggested Objectives

1. Demonstrate the high-quality personal standards expected in the workforce. <sup>DOK1</sup>
  - a. Report to work on time daily, ready to take directions and demonstrate motivation to accomplish the task at hand.
  - b. Dress appropriately and use language and manners suitable for the workplace.
  - c. Maintain appropriate personal hygiene.
  - d. Meet and maintain employment eligibility criteria such as drug/alcohol-free status, clean driving record, and so forth.
  - e. Demonstrate honesty, integrity, and reliability.
2. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. <sup>DOK2</sup>
  - a. Comply with workplace policies/laws.
  - b. Contribute to the success of the team, assist others, and request help when needed.
  - c. Work well with all customers and coworkers.
  - d. Negotiate solutions to interpersonal and workplace conflicts.
  - e. Contribute ideas and demonstrate initiative.
  - f. Follow directions.
  - g. Communicate (written and verbally) effectively with customers and coworkers.
  - h. Read and interpret workplace documents. Write clearly and concisely.
  - i. Analyze and resolve problems that arise in completing assigned tasks.
  - j. Organize and implement a productive plan of work.
  - k. Use scientific, technical, engineering, and mathematics principles and reasoning to accomplish assigned tasks.
  - l. Identify and address the needs of all customers. Provide helpful, courteous, and knowledgeable service and advice as needed.
  - m. Communicate effectively with customers, colleagues, and employers to include conflict resolution.

## Unit 3: Automotive Shop and Personal Safety

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### Competencies and Suggested Objectives

1. Identify and describe general safety rules. <sup>DOK1</sup>
  - a. Identify general shop safety rules and procedures.
  - b. Utilize safe procedures for handling of tools and equipment.
  - c. Identify and use proper placement of floor jacks and jack stands.
  - d. Identify and use proper procedures for safe lift operation.
  - e. Utilize proper ventilation procedures for working within the lab/shop area.
  - f. Identify marked safety areas.
  - g. Identify the location and the types of fire extinguishers and other fire safety equipment.
  - h. Demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
  - i. Identify the location and use of eyewash stations.
  - j. Identify the location of the posted evacuation routes.
  - k. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
  - l. Identify and wear appropriate clothing for lab/shop activities.
  - m. Secure hair and jewelry for lab/shop activities.
  - n. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.
  - o. Demonstrate awareness of the safety aspects of high-voltage circuits (e.g., high-intensity discharge [HID] lamps, ignition systems, injection systems, etc.).
  - p. Locate and demonstrate knowledge of safety data sheets (SDS).
  - q. Identify and explain the procedures for lifting heavy objects.

**Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

## Unit 4: Tools and Equipment

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### Competencies and Suggested Objectives

1. Explore tools and equipment used in the automotive service industry. <sup>DOK2</sup>
  - a. Identify tools and their usage in automotive applications.
  - b. Identify standard and metric designation.
  - c. Demonstrate safe handling and use of appropriate tools.
  - d. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
  - e. Demonstrate proper use of precision measuring tools (e.g., micrometer, dial indicator, dial caliper).

## Unit 5: Preparing a Vehicle for Service

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### Competencies and Suggested Objectives

1. Explore the procedures for preparing a vehicle for automotive service. <sup>DOK2</sup>
  - a. Identify information needed and the service requested on a repair order.
  - b. Identify purpose and demonstrate proper use of fender covers and mats.
  - c. Demonstrate use of the three C's (i.e., concern, cause, and correction).
  - d. Review the vehicle's service history.
  - e. Complete a work order to include customer information, vehicle-identifying information, customer concern, related service history, problem causes, and corrections.
  - f. Ensure the vehicle is prepared to return to customer per school/company policy (i.e., floor mats, steering wheel cover, etc.).

## Unit 6: Maintenance

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### Competencies and Suggested Objectives

1. Inspect and perform general maintenance. <sup>DOK2</sup>
  - a. Discuss the importance of regularly scheduled maintenance procedures as outlined in the owner's manual and related to vehicle performance and longevity.
  - b. Complete a work order and maintenance record for a given vehicle.
  - c. Check all under-hood fluid levels (e.g., engine oil, transmission fluid, brake fluid, power steering fluid, and coolant).
  - d. Visually inspect the vehicle for oil and fluid leaks and determine needed repairs.
  - e. Use service information to select proper lubricants, capacities, and filters for lubrication service.
  - f. Identify lubrication system components and configurations.
  - g. Change engine oil and filter accordance to manufacturer's specifications and reset maintenance reminder as required.
  - h. Perform a chassis and body lubrication.
  - i. Inspect and service as needed other filters on the engine including air, fuel, positive crankcase ventilation (PCV) valve crankcase vent filters, and so forth.
  - j. Conduct a general preventive maintenance inspection of hoses, belts, wiper blades, headlights, accessory lights, tires, exhaust, shocks, and so forth. Repair/replace/adjust as needed.
  - k. Clean and service the battery's case, cables, and connections and check its electrolyte level (if applicable). Maintain electronic memory functions while cleaning.

## Unit 7: Wheel and Tire

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### Competencies and Suggested Objectives

1. Perform tire and wheel diagnosis and repair. <sup>DOK2</sup>
  - a. Inspect tire condition/age, identify tire wear patterns, check for correct tire size, application (service class, load, and speed ratings), and air pressure as listed on the tire information placard/label.
  - b. Rotate tires according to the manufacturer's recommendations, including vehicles equipped with tire pressure monitoring systems (TPMS).
  - c. Dismount, inspect, and remount tire on wheel (with/without TPMS), balance wheel and tire assembly.
  - d. Inspect tire and wheel assembly for air loss; determine necessary action.
  - e. Repair tire following tire manufacturer-approved procedure.
  - f. Identify indirect and direct TPMS; calibrate/relearn system; verify operation of instrument panel lamps.
  - g. Demonstrate knowledge of steps required to remove and replace sensors in a TPMS (per OEM/sensor manufacturer).
  - h. Perform road force balance/match mounting.



## Unit 8: Engine Repair

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### Competencies and Suggested Objectives

1. Identify and describe general vehicle information and repairs. <sup>DOK2</sup>
  - a. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls. Include vehicles equipped with advanced driver assistance systems (ADAS).
  - b. Retrieve and record diagnostic trouble codes (DTCs), onboard diagnostics (OBD) monitor status, and freeze frame data. Clear codes and data when directed.
  - c. Verify operation of the instrument panel engine warning indicators.
  - d. Inspect engine assembly for fuel, oil, coolant, and other leaks.
  - e. Install engine covers using gaskets, seals, and sealers as required.
  - f. Demonstrate understanding of the procedure for verifying engine mechanical timing.
  - g. Inspect engine mounts.
  - h. Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.

# Unit 9: Engine Cylinder Head and Block

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Identify cylinder head, valve train, and engine block components and operation. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify cylinder head and valve train components and configuration.</li><li>b. Identify engine block assembly components and configurations.</li></ol></li></ol> |
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# Unit 10: Cooling Systems

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## Competencies and Suggested Objectives

1. Inspect, replace, and adjust accessory drive belt and cooling systems. <sup>DOK2</sup>
  - a. Identify cooling system components and configurations.
  - b. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs.
  - c. Identify causes of engine overheating.
  - d. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
  - e. Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.
  - f. Identify types of water pumps (e.g., belt driven, chain driven, electrical, etc.)
  - g. Remove, inspect, and replace thermostat and gasket/seal.

# Unit 11: General Brakes

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## Competencies and Suggested Objectives

1. Explore general brake systems and theories of operation. <sup>DOK2</sup>
  - a. Research vehicle service information including fluid type, vehicle service history, service precautions, technical service bulletins and recalls. Include vehicles equipped with ADAS.
  - b. Identify brake system components and configuration.
  - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
  - d. Describe the procedure for performing a road test to check brake system operation including an antilock brake system (ABS).
  - e. Install wheel and torque lug nuts.

## Unit 12: Hydraulic Brake Systems

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### Competencies and Suggested Objectives

1. Apply concepts of hydraulic brake systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup>
  - a. Demonstrate understanding of hydraulic principles (Pascal's law).
  - b. Describe proper brake pedal height, travel, and feel.
  - c. Check master cylinder proper operation.
  - d. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.
  - e. Select, handle, store, and fill brake fluids to the proper level; use the proper fluid type per manufacturer specification.
  - f. Identify components of hydraulic brake warning light systems.
  - g. Bleed and/or replace fluid in the brake system.
  - h. Test brake fluid for contamination.

# Unit 13: Disc Brake Systems

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## Competencies and Suggested Objectives

1. Apply concepts of disc brake systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup>
  - a. Remove and clean caliper assembly; inspect for leaks, damage, and wear.
  - b. Inspect caliper mounting and slides/pins for proper operation, wear, and damage.
  - c. Remove, inspect, and/or replace brake pads and retaining hardware.
  - d. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor and inspect for leaks.
  - e. Clean and inspect rotor and mounting surface, and measure rotor thickness, thickness variation, and lateral runout.
  - f. Remove and reinstall/replace rotor.
  - g. Refinish rotor on vehicle; measure final rotor thickness and compare with specification.
  - h. Refinish rotor off vehicle; measure final rotor thickness and compare with specification.
  - i. Retract and readjust the caliper piston on an integral parking brake system.
  - j. Describe the importance of operating the vehicle to burnish/break-in replacement brake pads according to manufacturers' recommendations.

# Unit 14: Drum Brake Systems

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## Competencies and Suggested Objectives

1. Apply concepts of drum brake systems by performing inspection, diagnosis, and repair.<sup>DOK2</sup>
  - a. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.
  - b. Refinish brake drum and measure final drum diameter; compare with specification.
  - c. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
  - d. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
  - e. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.

## Unit 15: Basic Electrical/Electronic Systems

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### Competencies and Suggested Objectives

1. Explore general electrical/electronic systems and theories of operation. <sup>DOK2</sup>
  - a. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
  - b. Identify electrical/electronic system components and configurations.
  - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
  - d. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
  - e. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
  - f. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
  - g. Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.
  - h. Use fused jumper wires to check operation of electrical circuits per service information.
  - i. Use wiring diagrams to trace electrical/electronic circuits.
  - j. Measure key-off battery drain (i.e., parasitic draw).
  - k. Inspect and test fusible links, circuit breakers, and fuses.
  - l. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).



# Unit 16: Battery System

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## Competencies and Suggested Objectives

1. Apply concepts of battery systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup>
  - a. Perform battery state-of-charge test; determine necessary action.
  - b. Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test.
  - c. Maintain or restore electronic memory functions as recommended by the manufacturer.
  - d. Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.
  - e. Charge battery according to manufacturers' recommendations.
  - f. Jumpstart vehicle using jumper cables and a booster battery or an auxiliary power supply.
  - g. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting the vehicle battery.

# Unit 17: Starting System

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Apply concepts of starting systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Perform starter current draw test.</li><li>b. Perform starter circuit voltage drop tests.</li><li>c. Inspect and test starter relays and solenoids.</li><li>d. Remove and install starter in a vehicle.</li><li>e. Inspect and test switches, connectors, and wires of starter control circuits.</li><li>f. Demonstrate knowledge of an automatic idle-stop/start-stop system.</li></ol></li></ol> |
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# Unit 18: Charging System

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Apply concepts of charging systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Perform charging system output test.</li><li>b. Inspect, adjust, and/or replace generator (i.e., alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.</li><li>c. Remove, inspect, and/or replace generator (i.e., alternator).</li><li>d. Perform charging circuit voltage drop tests.</li></ol></li></ol> |
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# Unit 19: Body and Lighting Systems

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## Competencies and Suggested Objectives

1. Explore the operation of and perform diagnosis, service and repair on the lighting, instrument cluster, and body electrical systems. <sup>DOK2</sup>
  - a. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (e.g., fog lights, driving lights, etc.); replace as needed.
  - b. Aim headlights.
  - c. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.
  - d. Demonstrate understanding of vehicle comfort, convenience, access, safety, and operation of related systems.
  - e. Remove and reinstall the door panel.
  - f. Describe the operation of keyless entry and/or remote start systems.
  - g. Describe disabling and enabling procedures for SRS; verify indicator lamp operation.
  - h. Verify windshield wiper and washer operation; replace wiper blades.

## Unit 20: Automotive Heating, Ventilation, and Air Conditioning (HVAC)

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### Competencies and Suggested Objectives

1. Discuss theory and operation of the air-conditioning and heating system. <sup>DOK2</sup>
  - a. Research vehicle service information including refrigerant/oil/fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
  - b. Identify HVAC components and configurations.
  - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
  - d. Identify steps of an air conditioner performance test.
  - e. Identify abnormal operating noises in the air-conditioning system.
  - f. Visually inspect the air-conditioning system for signs of leaks.
  - g. Identify and interpret heating and air-conditioning problems.
2. Identify, inspect, and perform general maintenance and repair on the air-conditioning system and related components. <sup>DOK2</sup>
  - a. Inspect and/or replace air conditioner compressor drive belts, pulleys, and tensioners.
  - b. Inspect air-conditioning condenser for proper airflow.
  - c. Inspect evaporator housing condensation drain.
3. Diagnose, service and repair the heating, ventilation, and engine cooling systems. <sup>DOK2</sup>
  - a. Inspect engine cooling and heater systems hoses and pipes.
4. Identify, inspect, and diagnose HVAC controls, relays, and resistors, actuators, cables, and condensate drains; determine necessary action for general maintenance and repair. <sup>DOK 2</sup>
  - a. Inspect HVAC ducts, doors, hoses, cabin filters, and outlets.
  - b. Identify the source of HVAC system odors.
  - c. Identify and inspect blower motor assembly for proper air flow and remove any debris.

**Note:** For every task in Automotive HVAC, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, proper ventilation, and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

# Unit 21: Safety and Workplace Employability Skills Review

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<b>Competencies and Suggested Objectives</b>	
1. Identify and describe general safety rules. <sup>DOK1</sup>	<ul style="list-style-type: none"><li>a. Identify general shop safety rules and procedures.</li><li>b. Utilize safe procedures for handling of tools and equipment.</li><li>c. Identify and use proper placement of floor jacks and jack stands.</li><li>d. Identify and use proper procedures for safe lift operation.</li><li>e. Utilize proper ventilation procedures for working within the lab/shop area.</li><li>f. Identify marked safety areas.</li><li>g. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.</li><li>h. Identify the location and use of eye-washing stations.</li><li>i. Identify the location of the posted evacuation routes.</li><li>j. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.</li><li>k. Identify and wear appropriate clothing for lab/shop activities.</li><li>l. Secure hair and jewelry for lab/shop activities.</li><li>m. Demonstrate awareness of the safety aspects of SRS, electronic brake control systems, and hybrid vehicle high-voltage circuits.</li><li>n. Demonstrate awareness of the safety aspects of high voltage circuits (e.g., high-intensity discharge [HID] lamps, ignition systems, injection systems, etc.).</li><li>o. Locate and demonstrate knowledge of SDS.</li><li>p. Identify and explain the procedures for lifting heavy objects.</li></ul>
2. Demonstrate the high-quality personal standards expected in the workforce. <sup>DOK1</sup>	<ul style="list-style-type: none"><li>a. Report to work daily on time, ready to take directions, and demonstrate motivation to accomplish the task at hand.</li><li>b. Dress appropriately and use language and manners suitable for the workplace.</li><li>c. Maintain appropriate personal hygiene.</li><li>d. Meet and maintain employment eligibility criteria (e.g., drug/alcohol-free status, clean driving record, etc.).</li><li>e. Demonstrate honesty, integrity, and reliability.</li></ul>
3. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. <sup>DOK2</sup>	<ul style="list-style-type: none"><li>a. Comply with workplace policies/laws.</li><li>b. Contribute to the success of the team, assist others, and request help when needed.</li><li>c. Work well with all customers and coworkers.</li><li>d. Negotiate solutions to interpersonal and workplace conflicts.</li><li>e. Contribute ideas and demonstrate initiative.</li></ul>

- f. Follow directions.
- g. Communicate — both written and verbally — effectively with customers and coworkers.
- h. Read and interpret workplace documents; write clearly and concisely.
- i. Analyze and resolve problems that arise in completing assigned tasks.
- j. Organize and implement a productive plan of work.
- k. Use scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.
- l. Identify and address the needs of all customers, providing helpful, courteous, and knowledgeable service and advice as needed.
- m. Communicate effectively with customers, colleagues, and employers to include conflict resolution.

**Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

## Unit 22: Suspension and Steering Systems Operation

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### Competencies and Suggested Objectives

1. Explore general suspension and steering systems and theories of operation. <sup>DOK2</sup>
  - a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
  - b. Identify suspension and steering system components and configurations.
  - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
  - d. Disable and enable SRS; verify indicator lamp operation.



## Unit 23: Steering Systems

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### Competencies and Suggested Objectives

1. Apply concepts of steering systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup>
  - a. Inspect inner tie rod ends/sockets of a rack and pinion steering gear; inspect the bellows/dust boots.
  - b. Inspect power steering fluid level and condition.
  - c. Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.
  - d. Inspect for power steering fluid leakage.
  - e. Remove, inspect, replace, and/or adjust power steering pump drive belt.
  - f. Inspect, remove and/or replace power steering hoses and fittings.
  - g. Inspect pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper.
  - h. Inspect tie rod ends/sockets, tie rod sleeves, and clamps (non-rack and pinion).
  - i. Inspect electric power steering system.
  - j. Inspect upper and lower control arms, bushings, and shafts.
  - k. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
  - l. Inspect upper and lower ball joints (with or without wear indicators).
  - m. Inspect suspension system coil springs and spring insulators (silencers).
  - n. Inspect suspension system torsion bars and mounts.
  - o. Inspect and/or replace front stabilizer bar (sway bar) bushings, brackets, and links.
  - p. Inspect, remove and/or replace strut cartridge or assembly; inspect mounts and bushings.
  - q. Inspect front strut bearing and mount.
  - r. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.
  - s. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
  - t. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
  - u. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
  - v. Describe the function of steering and suspension control systems and components (i.e., active suspension, and stability control).

## Unit 24: Suspension Systems

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### Competencies and Suggested Objectives

1. Apply concepts of suspension systems by performing inspection, diagnosis, and repair.<sup>DOK2</sup>
  - a. Inspect upper and/or lower control arms, bushings, and shafts.
  - b. Inspect and replace rebound/jounce bumpers.
  - c. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
  - d. Inspect upper and/or lower ball joints (with or without wear indicators).
  - e. Inspect suspension system coil springs and spring insulators.
  - f. Inspect torsion bars and mounts.
  - g. Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.
  - h. Inspect, remove and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount.
  - i. Inspect components of suspension systems (i.e., coil, leaf, and torsion).
  - j. Inspect components of electronically controlled suspension systems.
  - k. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
  - l. Inspect front and rear wheel bearings.
  - m. Describe the function of electronically controlled suspension and steering systems and components (i.e., active suspension and stability control).

## Unit 25: Wheel Alignment

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Apply concepts of wheel alignment. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Perform prealignment inspection and measure vehicle ride height.</li><li>b. Describe four-wheel alignment angles (e.g., camber, caster, toe, etc.) and the effects on tire wear and handling the vehicle.</li></ol></li></ol>

## Unit 26: Engine Performance

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### Competencies and Suggested Objectives

1. Explore general engine components and testing of proper operation. <sup>DOK2</sup>
  - a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
  - b. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
  - c. Demonstrate understanding of proper engine cooling system operation.
  - d. Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems.

## Unit 27: Computerized Controls

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Apply concepts of computerized engine controls by performing inspection, diagnosis. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify computerized control system components and configurations.</li></ol></li></ol> |
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# Unit 28: Ignition System

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<b>Competencies and Suggested Objectives</b>
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|---|
| <ol style="list-style-type: none"><li>1. Apply concepts of ignition systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify ignition system components and configuration.</li><li>b. Remove, inspect, and replace spark plugs, and inspect secondary ignition components for wear and damage.</li></ol></li></ol> |
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## Unit 29: Fuel, Air Induction, and Exhaust Systems

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### Competencies and Suggested Objectives

1. Apply concepts of fuel, air induction, and exhaust systems by performing inspection, diagnosis, and repair as needed. <sup>DOK2</sup>
  - a. Identify fuel, air induction, and exhaust system components and configurations.
  - b. Replace fuel filter(s) where applicable.
  - c. Inspect, service, or replace air filters, filter housings, and intake ductwork.
  - d. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields.
  - e. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields.
  - f. Check and refill diesel exhaust fluid (DEF).

# Unit 30: Emission Control Systems

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Apply concepts of emissions control systems by performing inspection, diagnosis, and repair. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify emission control system components and configuration.</li><li>b. Inspect, test, service, and/or replace PCV filter/breather, valve, tubes, orifices, and hoses.</li></ol></li></ol> |
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# Unit 31: Antilock Brakes and Traction Control

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Explore antilock brake systems (ABS), traction control systems (TCS), and vehicle stability control systems. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify electronic brake control system components and describe their respective functions (e.g., ABS, TCS, electronic stability control [ESC] systems, etc.).</li><li>b. Describe the operation of a regenerative braking system.</li></ol></li></ol>

# Unit 32: Power-Assisted Brake Systems

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Apply concepts of power-assisted unit systems by performing inspection, diagnosis, and repair.<sup>DOK2</sup><ol style="list-style-type: none"><li>a. Check brake pedal travel with and without the engine running to verify proper power booster operation.</li><li>b. Identify components of the power-assisted brake system (i.e., vacuum, hydraulic, and electric)</li></ol></li></ol> |
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## Unit 33: Related Brake Systems

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### Competencies and Suggested Objectives

1. Apply concepts of related systems (i.e., wheel bearings, parking brakes, and electrical) by performing inspection, diagnosis, and repair. <sup>DOK2</sup>
  - a. Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races, replace seals; install hub; adjust bearings.
  - b. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.
  - c. Check parking brake operation (including electric parking brakes) and parking brake indicator light system operation.
  - d. Check operation of brake stop light system.
  - e. Inspect and replace wheel studs.

## Unit 34: Automatic Transmission and Transaxle

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### Competencies and Suggested Objectives

1. Explore general automatic transmissions and transaxles. <sup>DOK2</sup>
  - a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
  - b. Identify automatic transmission and transaxle components and configurations.
  - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
  - d. Inspect transmission or transaxle (including those equipped and not equipped with a dipstick) for transmission fluid condition, fluid level, and leaks.
  - e. Demonstrate knowledge of transmission and transaxle gear reduction and multiplication operation using driving, driven, and held member (i.e., power flow) principles.

# Unit 35: Automatic Transmission and Transaxle Service

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Explain, diagnose, service, and repair automatic, in-vehicle transmissions and transaxles.<sup>DOK2</sup><ol style="list-style-type: none"><li>a. Inspect external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.</li><li>b. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.</li><li>c. Demonstrate understanding of relearn principles.</li><li>d. Inspect, replace and/or align powertrain mounts.</li></ol></li></ol>

## Unit 36: CVT and Hybrid Transmission and Transaxle

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Explore continuously variable transmissions (CVTs) and hybrid transmission and/or transaxle operation. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Describe the operational characteristics of a CVT.</li><li>b. Describe the operational characteristics of a hybrid vehicle drivetrain.</li></ol></li></ol>

## Unit 37: Manual Drivetrain and Axles

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### Competencies and Suggested Objectives

1. Explain, diagnose, service, and repair manual, in-vehicle transmission and transaxles. <sup>DOK2</sup>
  - a. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins and recalls. Include vehicles equipped with ADAS.
  - b. Identify manual drivetrain and axle components and configuration.
  - c. Retrieve and record DTCs, OBD monitor status, and freeze frame data. Clear codes and data when directed.
  - d. Check fluid condition and for leaks.
  - e. Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification.
  - f. Describe the operational characteristics of an electronically controlled manual transmission/transaxle.

# Unit 38: Clutch

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Explain, diagnose, service, and repair clutch hydraulic system. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.</li><li>b. Check for hydraulic system leaks.</li><li>c. Identify components of the clutch system.</li></ol></li></ol> |
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## Unit 39: Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

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### Competencies and Suggested Objectives

1. Inspect and perform general maintenance on driveshafts, half shafts, universal joints, and constant-velocity (CV) joints for front-, rear-, all-, and four-wheel drive vehicles. <sup>DOK2</sup>
  - a. Inspect, remove, and/or replace bearings, hubs, and seals.
  - b. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.
  - c. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.

## Unit 40: Differential and Drive Axles

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### Competencies and Suggested Objectives

1. Inspect and perform general maintenance on differentials. <sup>DOK2</sup>
  - a. Inspect differential housing; check for leaks, inspect housing vent.
  - b. Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.
  - c. Drain and refill differential housing using proper fluid type per manufacturer specification.
  - d. Inspect and replace drive axle wheel studs.
  - e. Identify concerns related to variations in tire circumference and/or final drive ratios.

# Student Competency Profile

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**Student's Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit, which are the tasks that are necessary to be mastered to pass the national certification. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

Student's degree of competency will be noted using the following scale:

- 5** Mastered competencies. Able to perform all elements of the task successfully and independently without supervision.
- 4** Satisfactory performance of task. Acceptable performance of all elements of task with mastery of some elements.
- 3** Capable of performing task adequately, but some elements need improvement.
- 2** Satisfactory performance of some elements of task and unsatisfactory performance of some elements of task.
- 1** Unsatisfactory performance of task.
- 0** **Student missed task**

<b>Required Supplemental Tasks</b>		
<b>Shop and Personal Safety</b>		
1.	Identify general shop safety rules and procedures.	
2.	Utilize safe procedures for handling of tools and equipment.	
3.	Identify and use proper placement of floor jacks and jack stands.	
4.	Identify and use proper procedures for safe lift operation.	
5.	Utilize proper ventilation procedures for working within the lab/shop area.	
6.	Identify marked safety areas.	
7.	Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.	
8.	Identify the location and use of eyewash stations.	
9.	Identify the location of the posted evacuation routes.	
10.	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	
11.	Identify and wear appropriate clothing for lab/shop activities.	

	12.	Secure hair and jewelry for lab/shop activities.	
	13.	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.	
	14.	Demonstrate awareness of the safety aspects of high-voltage circuits (e.g., high-intensity discharge [HID] lamps, ignition systems, injection systems, etc.).	
	15.	Locate and demonstrate knowledge of safety data sheets (SDS).	
<b>Work Habits / Ethic</b>			
	1.	Complies with workplace policies/laws.	
	2.	Contributes to the success of the team, assists others, and requests help when needed.	
	3.	Works well with all customers and coworkers.	
	4.	Negotiates solutions to interpersonal and workplace conflicts.	
	5.	Contributes ideas and initiative.	
	6.	Follows directions.	
	7.	Communicates (written and verbal) effectively with customers and coworkers.	
	8.	Reads and interprets workplace documents; writes clearly and concisely.	
	9.	Analyzes and resolves problems that arise in completing assigned tasks.	
	10.	Organizes and implements a productive plan of work.	
	11.	Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.	
	12.	Identifies and addresses the needs of all customers; provides helpful, courteous, and knowledgeable service and advice as needed.	
	13.	Respectful of tools and property used in school and the workplace environment.	
<b>Preparing Vehicle for Customer</b>			
	1.	Ensure vehicle is prepared to return to customer per school/company policy (i.e., floor mats, steering wheel cover, etc.).	
<b>Workplace Employability Skills Personal Standards</b>			

	1.	Reports to work daily on time; able to take directions and motivated to accomplish the task at hand.	
	2.	Dresses appropriately and uses language and manners suitable for the workplace.	
	3.	Maintains appropriate personal hygiene.	
	4.	Meets and maintains employment eligibility criteria (e.g., drug/alcohol-free status, clean driving record, etc.).	
	5.	Demonstrates honesty, integrity, and reliability.	
<b>Tools and Equipment</b>			
	1.	Identify tools and their usage in automotive applications.	
	2.	Identify standard and metric designation.	
	3.	Demonstrate safe handling and use of appropriate tools.	
	4.	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	
	5.	Demonstrate proper use of precision measuring tools (e.g., micrometer, dial-indicator, dial-caliper).	
<b>Preparing Vehicle for Service</b>			
	1.	Identify information needed and the service requested on a repair order.	
	2.	Identify purpose and demonstrate proper use of fender covers, mats.	
	3.	Demonstrate use of the three Cs (concern, cause, and correction).	
	4.	Review vehicle service history.	
	5.	Complete work order to include customer information, vehicle-identifying information, customer concern, related service history, cause, and correction.	

<b>Engine Repair</b>			
<b>A. General</b>			
	1.	Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1

	3.	Verify operation of the instrument panel engine warning indicators.	P1
	4.	Inspect engine assembly for fuel, oil, coolant, and other leaks.	P1
	5.	Install engine covers using gaskets, seals, and sealers as required.	P2
	6.	Demonstrate understanding of the procedure for verifying engine mechanical timing.	P1
	7.	Inspect engine mounts.	P2
	8.	Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.	P2
<b>B. Cylinder Head and Valvetrain</b>			
	1.	Identify cylinder head and valve train components and configurations.	P1
<b>C. Engine Block Assembly</b>			
	1.	Identify engine block assembly components and configurations.	P1
<b>D. Lubrication and Cooling</b>			
	1.	Identify lubrication and cooling system components and configurations	P1
	2.	Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.	P1
	3.	Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs.	P1
	4.	Identify causes of engine overheating	P2
	5.	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P1
	6.	Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P1
	7.	Identify type of water pumps (belt driven, chain driven, and electric).	P3
	8.	Remove, inspect, and replace thermostat and gasket/seal.	P1

<b>Automatic Transmission and Transaxle</b>			
<b>A. General</b>			

	1.	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Identify automatic transmission and transaxle components and configurations.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick.	P1
	5.	Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle not equipped with a dipstick.	P3
	6.	Demonstrate knowledge of transmission/transaxle gear reduction/multiplication operation using driving, driven, and held member (power flow) principles.	P3
	7.	Demonstrate knowledge of hydraulic principles (Pascal's Law) in a transmission/transaxle.	P3
<b>B. In-Vehicle</b>			
	1.	Inspect external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P2
	2.	Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P1
	3.	Demonstrate understanding of relearn procedures.	P2
	4.	Inspect, replace and/or align power train mounts.	P3
<b>C. Off-Vehicle</b>			
	1.	Describe the operational characteristics of a continuously variable transmission (CVT).	P3
	2.	Describe the operational characteristics of a hybrid vehicle drivetrain.	P2

<b>Manual Drivetrains and Axles</b>			
<b>A. General</b>			
	1.	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Identify manual drivetrain and axle components and configurations.	P1

	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Check fluid condition; check for leaks.	P2
	5.	Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification.	P1
<b>B. Clutch</b>			
	1.	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P3
<b>C. Transmission/Transaxle</b>			
	1.	Describe the operational characteristics of an electronically controlled manual transmission/transaxle.	P2
<b>D. Driveshaft, Half Shaft, Universal Joints, and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-Wheel Drive)</b>			
	1.	Inspect and/or remove/replace bearings, hubs, and seals.	P2
	2.	Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints.	P2
	3.	Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P3
<b>E. Differential and Drive Axles</b>			
	<b>E. 1</b>	<b>Ring and Pinion Gears and Differential Housing Assembly</b>	
	1.	Inspect differential housing; check for leaks; inspect housing vent.	P1
	2.	Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification.	P1
	3.	Drain and refill differential housing; using proper fluid type per manufacturer specification.	P1
	<b>E. 2</b>	<b>Drive Axles</b>	
	1.	Inspect and replace drive axle wheel studs.	P2
<b>F. Four-wheel Drive/All-wheel Drive</b>			
	1.	Identify concerns related to variations in tire circumference and/or final drive ratios.	P3



<b>Suspension/Steering Systems</b>			
<b>A. General</b>			
	1.	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Identify suspension and steering system components and configurations.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P2
<b>B. Steering Systems</b>			
	1.	Inspect rack and pinion steering gear tie rod ends (sockets) and bellows boots.	P1
	2.	Inspect power steering fluid level and condition.	P2
	3.	Drain and replace power steering system fluid; use proper fluid type per manufacturer specification.	P2
	4.	Inspect for power steering fluid leakage.	P2
	5.	Remove, inspect, replace, and/or adjust power steering pump drive belt.	P2
	6.	Inspect, remove, and/or replace power steering hoses and fittings.	P2
	7.	Inspect pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P2
	8.	Inspect tie rod ends (sockets), tie rod sleeves, and clamps (non-rack and pinion).	P2
	9.	Inspect electric power steering system.	P2
<b>C. Suspension Systems</b>			
	1.	Inspect upper and/or lower control arms, bushings, and shafts.	P2
	2.	Inspect and replace rebound/jounce bumpers.	P3
	3.	Inspect track bar, strut rods/radius arms, and related mounts and bushings.	P2
	4.	Inspect upper and/or lower ball joints (with or without wear indicators).	P2
	5.	Inspect suspension system coil springs and spring insulators.	P2
	6.	Inspect torsion bars and mounts.	P3

	7.	Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P2
	8.	Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount.	P2
	9.	Inspect components of suspension systems (Coil, Leaf, and Torsion).	P1
	10	Inspect components of electronically controlled suspension systems.	P2
<b>D. Related Suspension and Steering Service</b>			
	1.	Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P2
	2.	Inspect front and rear wheel bearings.	P1
	3.	Describe the function of electronically controlled suspension and steering systems and components, (i.e., active suspension and stability control).	P2
<b>E. Wheel Alignment</b>			
	1.	Perform pre-alignment inspection; measure vehicle ride height.	P2
	2.	Describe four-wheel alignment angles (camber, caster, and toe) and effects on vehicle handling\ tire wear.	P1
<b>F. Wheels and Tires</b>			
	1.	Inspect tire condition/age; identify tire wear patterns; check for correct tire size, application (service-class, load, and speed ratings), and air pressure as listed on the tire information placard/label.	P1
	2.	Rotate tires according to manufacturer's recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).	P1
	3.	Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.	P1
	4.	Inspect tire and wheel assembly for air loss; determine needed action.	P1
	5.	Repair tire following tire manufacturer approved procedure.	P1
	6.	Identify indirect and TPMS; calibrate/relearn system; verify operation of instrument panel lamps.	P1
	7.	Demonstrate knowledge of steps required to remove and replace sensors (per OEM/sensor manufacturer) in a TPMS.	P1
	8.	Perform Road Force balance/match mounting.	P3

<b>Brakes</b>			
<b>A. General</b>			
	1.	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Identify brake system components and configurations.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system.	P1
	5.	Install wheel and torque lug nuts.	P1
<b>B. Hydraulic System</b>			
	1.	Demonstrate understanding of hydraulic principles (Pascal's law).	P1
	2.	Describe proper brake pedal height, travel, and feel.	P1
	3.	Check the master cylinder for proper operation.	P1
	4.	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.	P1
	5.	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P1
	6.	Identify components of hydraulic brake warning light system.	P3
	7.	Bleed and/or replace fluid in the brake system.	P1
	8.	Test brake fluid for contamination.	P2
<b>C. Drum Brakes</b>			
	1.	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P2
	2.	Refinish brake drum and measure final drum diameter; compare with specification.	P3
	3.	Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P3
	4.	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P3

	5.	Preadjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P3
<b>D. Disc Brakes</b>			
	1.	Remove and clean caliper assembly; inspect for leaks and damage, and wear.	P1
	2.	Inspect caliper mounting and slides/pins for proper operation, wear, and damage.	P1
	3.	Remove, inspect, and/or replace brake pads and retaining hardware.	P1
	4.	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor; inspect for leaks.	P1
	5.	Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout.	P1
	6.	Remove and reinstall/replace rotor.	P1
	7.	Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P3
	8.	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P3
	9.	Retract and re-adjust caliper piston on an integrated parking brake system.	P2
	10	Describe the importance of operating vehicles to burnish/break-in replacement brake pads according to manufacturer's recommendation.	P2
<b>E. Power-Assist Units</b>			
	1.	Check brake pedal travel with and without engine running to verify proper power booster operation.	P2
	2.	Identify components of the brake power assist system (vacuum/hydraulic/electric).	P2
<b>F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)</b>			
	1.	Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings.	P3
	2.	Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P2
	3.	Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation.	P2
	4.	Check operation of brake stop light system.	P1

	5.	Inspect and replace wheel studs.	P2
<b>G. Electronic Brake, Traction Control, and Stability Control Systems</b>			
	1.	Identify electronic brake control system components and describe function (ABS, TCS, ESC).	P2
	2.	Describe the operation of a regenerative braking system.	P3

<b>Basic Electrical/Electronic Systems</b>			
<b>A. General</b>			
	1.	Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Identify electrical/electronic system components and configurations.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P1
	5.	Demonstrate proper use of a digital multimeter when measuring source voltage, voltage drop (including grounds), current flow, and resistance.	P1
	6.	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P1
	7.	Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.	P2
	8.	Use fused jumper wires to check operation of electrical circuits per service information.	P2
	9.	Use wiring diagrams to trace electrical/electronic circuits.	P1
	10.	Measure key-off battery drain (parasitic draw).	P2
	11.	Inspect and test fusible links, circuit breakers, and fuses.	P1
	12.	Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).	P2
<b>B. Batteries (Conventional 12-volt)</b>			
	1.	Perform battery state-of-charge test; determine needed action.	P1

	2.	Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test.	P1
	3.	Maintain or restore electronic memory functions as recommended by the manufacturer.	P2
	4.	Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs.	P1
	5.	Perform battery charging according to manufacturer's recommendations.	P1
	6.	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P1
	7.	Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.	P2
<b>C. Starting System</b>			
	1.	Perform starter current draw test.	P1
	2.	Perform starter circuit voltage drop tests.	P1
	3.	Inspect and test starter relays and solenoids.	P2
	4.	Remove and install starter in a vehicle.	P3
	5.	Inspect and test switches, connectors, and wires of starter control circuits.	P2
	6.	Demonstrate knowledge of an automatic idle-stop/start-stop system.	P2
<b>D. Charging System</b>			
	1.	Perform charging system output test.	P1
	2.	Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P1
	3.	Remove, inspect, and/or replace generator (alternator).	P3
	4.	Perform charging circuit voltage drop tests.	P2
<b>E. Lighting Systems</b>			
	1.	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (e.g., fog lights, driving lights). Replace as needed.	P1
	2.	Aim headlights.	P2
<b>F. Instrument Cluster and Driver Information Systems</b>			
	1.	Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.	P1

<b>G. Body Electrical Systems</b>			
	1.	Demonstrate understanding of vehicle comfort, convenience, access, safety, and related systems operation.	P3
	2.	Remove and reinstall the door panel.	P2
	3.	Describe the operation of keyless entry/remote-start systems.	P3
	4.	Describe disabling and enabling procedures for SRS. Verify indicator lamp operation.	P2
	5.	Verify windshield wiper and washer operation; replace wiper blades.	P1

<b>HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)</b>			
<b>A. General</b>			
	1.	Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Identify HVAC components and configuration.	P1
	3.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	4.	Identify steps of an A/C performance test.	P2
	5.	Identify abnormal operating noises in the A/C system.	P3
	6.	Visually inspect the A/C system for signs of leaks.	P1
	7.	Identify and interpret heating and air conditioning problems.	P1
<b>B. Refrigeration System Components</b>			
	1.	Inspect and/or replace A/C compressor drive belts, pulleys, and tensioners.	P1
	2.	Inspect for proper A/C condenser airflow.	P2
	3.	Inspect evaporator housing condensation drain.	P1
<b>C. Heating, Ventilation, and Engine Cooling Systems</b>			
	1.	Inspect engine cooling and heater systems hoses and pipes.	P1
<b>D. Operating Systems and Related Controls</b>			
	1.	Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets.	P1
	2.	Identify the source of HVAC system odors.	P2
<b>E. Refrigerant Recovery, Recycling, and Handling</b>			
	1.	Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures.	P1



<b>ENGINE PERFORMANCE</b>			
<b>A. General</b>			
	1.	Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	P1
	2.	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P1
	3.	Perform cylinder power balance test; document results.	P1
	4.	Perform cylinder cranking and running compression test; document results.	P1
<b>B. Computerized Controls</b>			
	1.	Identify computerized control system components and configurations.	P1
<b>C. Ignition System</b>			
	1.	Identify ignition system components and configurations.	P1
	2.	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P2
<b>D. Fuel, Air Induction, and Exhaust Systems</b>			
	1.	Identify fuel, air induction, and exhaust system components and configurations.	P1
	2.	Replace fuel filter(s) where applicable.	P2
	3.	Inspect, service, or replace air filters, filter housings, and intake duct work.	P1
	4.	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields.	P1
	5.	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields.	P1
	6.	Check and refill diesel exhaust fluid.	P3
<b>E. Emissions Control Systems</b>			
	1.	Identify emission control system components and configurations.	P1
	2.	Inspect, test, and service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses.	P2

# Appendix A: Industry Standards

## AUTOMOTIVE SERVICE TECHNICIAN PATHWAY CONTENT STANDARDS AND PERFORMANCE ELEMENTS

	Standard	A0 Shop Operations	A1 Engine Repair	A2 Automatic Transmission Transaxle	A3 Manual Drive Train & Axles	A4 Suspension and Steering	A5 Service Brakes	A6 Electrical/ Electronics	A7 Heating and Cooling	A8 Engine Performance
Unit										
1		X								
2		X								
3		X								
4		X								
5		X								
6			X							
7						X				
8			X							
9			X							
10			X							
11			X							
12							X			
13							X			
14							X			
15							X			
16								X		
17								X		
18								X		
19								X		
20								X		
21									X	
22		X								
23						X				
24						X				
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30										X
31							X			
32							X			
33							X			
34				X						
35				X						
36				X						
37					X					
38					X					
39					X					
40					X					

### A0 - Automotive Shop Operations

- Shop and Personal Safety
- Tools and Equipment
- Preparing Vehicle for Service
- Preparing Vehicle for Customer

### **A1 - Automotive Engine Repair**

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
- General
- Cylinder Head and Valve Train
- Lubrication and Cooling Systems

### **A2 - Automatic Transmission/Transaxle**

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
- General
- Automatic Transmission/Transaxle
  - General
  - In-Vehicle Transmission/Transaxle
  - Off-Vehicle Transmission and Transaxle

### **A3 - Manual Drivetrain and Axles**

- General
- Clutch
- Transmission/Transaxle
- Driveshaft, Half Shafts, Universal and Constant-Velocity (CV) Joints
- Differential Case Assembly
- Drive Axles
- Four-wheel Drive/All-wheel Drive

### **A4 - Automotive Suspension/Steering**

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. General Suspension and Steering Systems Diagnosis
- General
- Steering Systems Diagnosis and Repair
- Suspension Systems Diagnosis and Repair
- Related Suspension and Steering Service
- Wheel Alignment Diagnosis, Adjustment, and Repair
- Wheels and Tires Diagnosis and Repair

### **A5 - Automotive Service Brakes**

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage,

and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

- General Brake Systems Diagnosis
- Hydraulic System Diagnosis and Repair
- Drum Brake Diagnosis and Repair
- Disc Brake Diagnosis and Repair
- Power-Assist Units Diagnosis and Repair
- Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)
- Electronic Brakes, and Traction and Stability Control Systems Diagnosis and Repair

#### **A6 - Automotive Service Electrical/Electronics**

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
- General: Electric System Diagnosis
- Battery Diagnosis and Service
- Starting System Diagnosis and Repair
- Charging System Diagnosis and Repair
- Lighting Systems Diagnosis and Repair
- Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair
- Horn and Wiper/Washer Diagnosis and Repair
- Accessories Diagnosis and Repair

#### **A7 - Automotive Heating and Air Conditioning**

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
- General: A/C System Diagnosis and Repair
- Refrigeration System Component Diagnosis and Repair
- Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair
- Operating Systems and Related Controls Diagnosis and Repair
- Refrigerant Recovery, Recycling, and Handling

#### **A8 - Automotive Engine Performance**

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
- General: Engine Diagnosis
- Computerized Engine Controls Diagnosis and Repair
- Ignition System Diagnosis and Repair
- Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair
- Emissions Control Systems Diagnosis and Repair