

**OFFICE OF CHIEF ACADEMIC OFFICER**  
**Summary of State Board of Education Agenda Items**  
**Consent Agenda**  
**February 25, 2021**

**OFFICE OF CAREER AND TECHNICAL EDUCATION**

- C. 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 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 2021-2022 school year.

The following secondary curriculum frameworks are recommended for approval:

1. Forestry (Miss. Admin. Code 7-120)
2. Horticulture (Miss. Admin. Code 7-156)
3. Food Products (Meats) (Miss. Admin. Code 7-119)
4. Heating, Ventilation, and Air Conditioning (HVAC) (Miss. Admin. Code 7-157)
5. Industrial Maintenance (Miss. Admin. Code 7-158)
6. Television Broadcasting and Production (Miss. Admin. Code 7-79)
7. Keystone (Miss. Admin. Code 7-141)

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

The Office of Career and Technical Education has provided executive summaries of the curriculum framework revisions.

Recommendation: Approval

Back-up material attached

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

### **2021 Forestry**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- Minor adjustments made throughout units.
- Unit 2 - List of 28 group leadership skills added.
- Notes added to the end of Unit 3 to acknowledge safety and the need for ongoing reference throughout the year.
- Unit 4 - added competency 4: Discuss the carbon cycle in pine plantations.
- Unit 5 - List added of 15 common names/binomial names of trees.
- Unit 6 - Renamed Unit to: Forest Traversing and Mapping.
- Added Unmanned Aerial Systems (UAS) information to many units.

### **2021 Horticulture**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- Minor adjustments made throughout units.
- Shifted competencies around Unit 1 and added competency for a Supervised Agricultural Experience (SAE).
- Details and notes added to Unit 2.
- Change name of Unit 3 to “Basic Plant Structure and Function”.
- Added Unit 4 - “Plant Media”.
- Unit 5 is old Unit 4.
- Unit 6 is old Unit 5.
- Unit 7 is old Unit 6.
- Unit 8 is old Unit 7.
- Unit 9 is old Unit 8.
- Unit 10 is old Unit 9.
- Unit 11 is old Unit 10 and added competency 3 about business operations.
- Unit 12 is old Unit 11.
- Unit 13 is old Unit 12.
- Unit 14 is old Unit 13.
- Unit 15 is old Unit 14.
- Unit 16 is old Unit 15.

### **2021 Food Products (Meats)**

- Document in new curriculum format.
- Competencies and objectives reflect current standards and industry recommendations.
- Minor adjustments made throughout units.
- More notes about safety and competencies include more safety concepts.

- Chronic Wasting disease added to list of hazards to include current issues in the state.

## **2021 HVAC**

- Document placed in new curriculum format.
- Adjusted competencies and objectives to reflect current standards and industry recommendations.
- Added Work - Based Learning to Unit 1.
- Created new Units 2, 3, and 4.
- Moved Unit 2 to 5.
- Moved Unit 3 to 6.
- Split Unit 4 to 7 and 8.
- Moved Unit 5 to 9.
- Moved Unit 6 to 10.
- Unit 11 changed to “Introduction to HVAC” and other material split to Units 12 and 13.
- Moved Unit 7 to 12 and 13.
- Moved Unit 8 to 14.
- Removed old Unit 9 “Basic Refrigeration Gauges”.
- Moved Unit 10 to 15.
- Moved Unit 11 to 16.
- Moved Unit 12 to 17.
- Moved Unit 13 to 18 and moved old competency 2 to new Unit 19.
- Unit 19 added.
- Moved Unit 14 to 20, deleted competency 2, 3.a., and 3.b.
- Moved Unit 15 to 21, added competency 2 and removed old competency 3.
- Moved Unit 16 to 22, added competency 1.

## **2021 Industrial Maintenance**

- Document placed in new curriculum format.
- Units renumbered to reflect additions and changes.
- Adjusted competencies and objectives to reflect current standards and industry recommendations.
- Created new Units 2, 3, and 4.
- Moved Unit 2 to 5.
- Moved Unit 3 to 6.
- Split Unit 4 to 7 and 8.
- Moved Unit 5 to 9.
- Moved Unit 6 to 10.
- Added Work-Based Learning to Unit 1.
- Created new Units 11, 12, and 13 from old Unit 7 material.
- Moved material from old Units 8 and 9 to Unit 14.
- Moved Unit 10 to 15.
- Moved Unit 11 to 16 and added competency 4.

- Moved Unit 12 to 17.
- Split Unit 13 into new Units 18, 19, 20, and 21.
- Split Unit 14 into new Units 22, 23, 24, and 25.
- Split Unit 16 into new Units 26, 27, and 28.
- Deleted content in old Unit 17.
- Changed content in Unit 29 to SMAW – Groove Welds with Backing.

## **2021 Television Broadcasting and Production**

- Document placed in new curriculum format.
- Units renumbered to reflect additions and changes.
- Adjusted competencies and objectives to reflect current standards and industry recommendations.
- Split old Unit 1 into new Unit 1 and Unit 2.
- Added competency 2 to new Unit 4.
- Added competency 2 to new Unit 5.
- Material from old Unit 9 moved to new Units 6 and 7.
- Moved Unit 5 to 9.
- Moved Unit 7 to 10.
- Moved Unit 4 to 11.
- Moved Unit 10 to 12.
- Moved Unit 11 to 13, added competencies 4, 5, and 7.
- Moved Unit 13 to 14 and changed name to “Social Media and Nontraditional Media”.
- Removed old competency 2 from Unit 15.
- Moved Unit 19 to 16.
- Moved Unit 15 to 17.
- Unit 18 is new and material came from old Unit 15.
- Moved Unit 16 to 19.
- Moved Unit 17 to 20.
- Moved Unit 18 to 21.

## **2021 Keystone**

- Document placed in newest curriculum format.
- Adjusted competencies and objectives to facilitate College and Career Ready standards and 21<sup>st</sup> Century Learning.
- Moved Unit 19, competency 1, objectives d - f to Unit 19, competency 2.
- Moved Unit 19, competency 2, objectives a - c to Unit 19, competency 3.
- Moved Unit 19, competency 3, objectives a - d to Unit 19, competency 4.
- Added Unit 19, competency 5.
- Renamed Unit 20.
- Removed Unit 20, competency 1 - 7, added new competencies and objectives.
- Removed Unit 21.
- Added a link to the Teacher Resource Document after each unit.
- 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.





## 2021 Forestry

Program CIP: CIP: 03.0511 – Forestry Technology/Technician

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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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Dr. Carey M. Wright, state superintendent of education  
Dr. Jason S. Dean, chair  
Ms. Rosemary G. Aultman, vice chair  
Dr. Karen J. Elam  
Dr. Angela Bass  
Mr. Glen East  
Dr. Ronnie McGehee  
Mr. Omar G. Jamil, student representative  
Ms. Amy Zhang, student representative

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Kellie Cauthen, an instructional design specialist for the RCU, researched and coauthored this framework. [helpdesk@rcu.msstate.edu](mailto:helpdesk@rcu.msstate.edu)

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Betsey Smith, director of the RCU

Sam Watts, curriculum manager for the RCU

Melissa Lockett, an instructional design specialist for the RCU

# Standards

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Standards and alignment crosswalks are referenced in the appendices. Mississippi's CTE forestry 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. A complete copy of the standards can be accessed at [thecouncil.ffa.org/afnr/](http://thecouncil.ffa.org/afnr/). The National AFNR Career Cluster Content Standards are copyrighted to the National Council for Agricultural Education and are used by permission.

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

Reprinted with permission from *ISTE Standards for Students* (2016). All rights reserved. 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 Ready 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.  
[mde.k12.ms.us/mccrs](http://mde.k12.ms.us/mccrs)

## **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**

Forestry is a pathway in the agriculture, food, and natural resources career cluster. This program is designed for students who wish to enter occupations related to the field of forestry. The first-year topics include exploring the world of forestry, leadership/FFA activities, forest safety, tree growth and stand development, dendrology, forest surveying and mapping, legal land descriptions, tree and log measurements, and introduction to timber cruising. The second-year instruction focuses on identifying forests and forest products, employability skills/FFA activities, forest management practices, advanced timber cruising, timber marketing, timber harvesting, reforestation, forest fire management, and forest insects and diseases. Graduates may become employed at the entry level or pursue careers in forestry, agriculture, agribusiness, or natural resources education in postsecondary or higher education.

## **College, Career, and Certifications**

Competencies and suggested performance indicators in the forestry course have been correlated to the National AFNR Career Cluster Content Standards, which 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 a ninth grader. 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 both classroom- and 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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## **Option 1—Four 1-Carnegie Unit Courses**

This curriculum consists of four 1-credit courses, which should be completed in the following sequence:

- 1. Forestry Introduction—Course Code: 991502**
- 2. Forestry Surveying and Measurements—Course Code: 991503**
- 3. Forestry Cruising—Course Code: 991504**
- 4. Forestry Marketing—Course Code: 991505**

### **Course Description: Forestry Introduction**

Forestry Introduction provides the building blocks for knowledge and understanding in forestry. Students will cover topics such as the National FFA Organization, leadership skills, safety, and dendrology. Additionally, students will cover forest surveying and mapping techniques necessary for the next course offering.

### **Course Description: Forestry Surveying and Measurements**

Forestry Surveying and Measurements offers insight into the world of legal documents used in forestry. Students will be well versed in the use of legal land descriptions as well as how to perform tree and log calculations. Students will also be introduced to timber cruising activities.

### **Course Description: Forestry Cruising**

Forestry Cruising examines timber cruise practices more deeply. Students will also be exposed to employability skills and career opportunities in forestry. Additional topics include forest types, products, and management techniques.

### **Course Description: Forestry Marketing**

Forestry Marketing delivers information about timber harvesting, sales, and reforestation techniques. Additionally, students will be exposed to fire management and safety as well as common insect and disease problems encountered in forestry.

**Forestry Introduction—Course Code: 991502**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
1	Exploring the World of Forestry	7.5
2	Leadership Development	10
3	Forest Safety	20
4	Tree Growth and Stand Development	7.5
5	Dendrology	30
6	Forest Traversing and Mapping	37.5
<b>Total</b>		<b>112.5</b>

**Forestry Surveying and Measurements—Course Code: 991503**

<b>Unit</b>	<b>Unit Title</b>	<b>Hours</b>
7	Legal Land Descriptions	30
8	Tree and Log Measurements	37.5
9	Introduction to Timber Cruising	45
<b>Total</b>		<b>112.5</b>

**Forestry Cruising—Course Code: 991504**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
10	Identifying Forests and Forest Products	7.5
11	Employability Skills and Leadership Development	7.5
12	Forest Management Practices	45
13	Advanced Timber Cruising	52.5
<b>Total</b>		<b>112.5</b>

**Forestry Marketing—Course Code: 991505**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
14	Timber Marketing	15
15	Timber Harvesting	20
16	Reforestation	25
17	Forest Fire Management	25
18	Forest Insects and Diseases	22.5
<b>Total</b>		<b>107.5</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. **Forestry I—Course Code: 991500**
2. **Forestry II—Course Code: 991501**

### Course Description: Forestry I

Forestry I is designed to introduce students to the forestry industry and careers in Mississippi. The course provides instruction on careers and leadership, forest safety, tree growth and development, dendrology, surveying and mapping, and tree and log measurements. Emphasis is placed on the scientific and technical principles of modern forest management.

### Course Description: Forestry II

Forestry II is a continuation of Forestry I with additional emphasis on forest management, timber cruising, marketing and harvesting methods, reforestation, fire management, and forest pests. Emphasis is placed on scientific and technical principles.

### Forestry I—Course Code: 991500

Unit	Unit Name	Hours
1	Exploring the World of Forestry	7.5
2	Leadership Development	10
3	Forest Safety	20
4	Tree Growth and Stand Development	7.5
5	Dendrology	30
6	Forest Traversing and Mapping	37.5
7	Legal Land Descriptions	30
8	Tree and Log Measurements	37.5
9	Introduction to Timber Cruising	45
<b>Total</b>		<b>225</b>

**Forestry II—Course Code: 991501**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
10	Identifying Forests and Forest Products	7.5
11	Employability Skills and Leadership Development	7.5
12	Forest Management Practices	45
13	Advanced Timber Cruising	52.5
14	Timber Marketing	15
15	Timber Harvesting	20
16	Reforestation	25
17	Forest Fire Management	25
18	Forest Insects and Diseases	22.5
<b>Total</b>		<b>220</b>

# Career Pathway Outlook

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## Overview

The agricultural and natural resources cluster covers a broad field of occupations related to the production and use of plants and animals for food, fiber, aesthetic, and environmental purposes. Forestry covers establishments primarily engaged in the operation of timber tracts, tree farms, or forest nurseries; in the gathering of forest products; or in performing forestry services. Forestry and conservation workers measure and improve the quality of forests. Forest and conservation workers typically work for state and local governments or on privately owned forest lands or nurseries. Governments also employ forest and conservation workers on a contractual basis. According to the MSU College of Forest Resources, forestry is Mississippi's second largest commodity, behind poultry and eggs. Forestry in combination with forest products is even larger and employs a workforce of 69,000 individuals in Mississippi across four sectors: logging, solid wood products, pulp and paper, and wood furniture.

## Needs of the Future Workforce

Data for this synopsis were compiled from employment projections prepared by the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (2019), and the Mississippi Department of Employment Security (2019).

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings (2019)
Conservation Scientists	700	730	30	4.3	\$26.38
First-Line Supervisors of Farming, Fishing, and Forestry Workers	940	990	50	5.3	N/A
Foresters	190	200	10	5.3	\$28.80
Forest and Conservation Technicians	220	230	10	4.6	\$22.79
Forestry and Conservation Science Teachers, Postsecondary	40	50	10	25.0	N/A
Logging Equipment Operators	1,680	1,740	60	3.6	\$18.48

Source: Mississippi Department of Employment Security; [mdes.ms.gov](http://mdes.ms.gov) (2020).

## Perkins V Requirements and Academic Infusion

The forestry curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in fields related to agriculture and natural resources. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for forestry careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, the curriculum 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 forestry 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*

There are student organizations relevant to this curriculum. Teachers are encouraged to charter one of these organizations if one is not already available to students. The suggested organization for this course is the National FFA Organization. Contact information for this and other related organizations is listed under the Professional Organizations section of this document.

#### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the forestry 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. This curriculum provides opportunities for students to work together and help each other complete complex tasks, including field experiences that will allow and encourage collaboration with professionals currently in the forestry field.

#### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the forestry 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 forestry professionals. Thus, supervised collaboration and immersion into the forestry 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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## **Suggested Time on Task**

This section indicates an estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80% of the time in the course. The remaining percentage of class time will include instruction in nontested material, review for end-of-course testing, and special projects.

## **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 (TRD) 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 forestry 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 forestry 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: Exploring the World of Forestry

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## Competencies and Suggested Objectives

1. Explain the importance of forestry. <sup>DOK1</sup>
  - a. Describe the elements of a forest community, including trees, plants, shrubs, soil, water, and animal life.
  - b. Describe the importance of trees and forests, including products, employment, climate, air quality, erosion, and recreation.
  - c. Describe the amount of forested land worldwide and in the United States, including acres of forestland and acres of commercial land within the local county or regional area.
  - d. Describe the history of forestry, including the importance of forestry to the South and to Mississippi.
  - e. Describe the importance of forests in the South, including growing season, timber inventory, and economic impact.
  - f. Describe resources considered in multiple-use forest management, including timber, soil, wildlife, recreation, and water.
2. Explain careers in the field of forestry. <sup>DOK1</sup>
  - a. Identify the careers available in the field of forestry.
  - b. Describe educational requirements, job opportunities, duties, and responsibilities for professional, technical, and forestry workers.

## Enrichment

### The Forest Community

Divide students into groups and assign one component of the forest community to each group to research, summarize, and prepare a fact sheet and present it to the class. Presentations will be scored based on the presentation rubric in the TRD.

### Forestry Career Paths

Assign each student a career within forestry to investigate and compare educational requirements, job opportunities, and duties and responsibilities. Students will develop a slideshow presentation to the class about their findings. Presentations will be scored based on the presentation rubric.

# Unit 2: Leadership Development

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## Competencies and Suggested Objectives

1. Explain the benefits of FFA participation. <sup>DOK 1</sup>
  - a. Identify FFA organizational activities that promote and recognize achievements in forestry, including career development events, personal development seminars, leadership conferences, national and international exchange programs, education experience with industry, and personal and community development programs.
  - b. Identify the benefits of FFA participation to an individual and to the forestry industry, including personal growth and development, exposure to the forestry industry environment, and multicultural experiences.
  - c. Identify opportunities for members in FFA, including personal development, personal recognition, career exploration, and self-expression.
2. Demonstrate group leadership skills and personal traits. <sup>DOK 2</sup>
  - Communication
  - Considerate
  - Cooperation
  - Dependability
  - Effective listening
  - Empathy
  - Enthusiasm
  - Getting along with others
  - Good manners
  - Honesty
  - Humility
  - Interpersonal skills
  - Loyalty
  - Open-minded
  - Positive self-concept
  - Problem-solving
  - Punctuality
  - Rational thinking
  - Resilience
  - Respect for others
  - Responsibility
  - Responsible use of social media
  - Safety conscious
  - Self-motivated/determined
  - Setting priorities
  - Teamwork
  - Trustworthy
  - Work ethic

## Enrichment

Select a local, county, or state FFA officer or alumni to discuss with students the benefits of the FFA. Students will be required to write a report discussing the various benefits following the speaker's presentation. Reports will be scored based on the written report rubric in the TRD.

# Unit 3: Forest Safety

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## Competencies and Suggested Objectives

1. Explain forest safety practices. <sup>DOK 1</sup>
  - a. Describe first aid and first aid equipment used in forestry work.
  - b. Describe job site safety practices, including hazard awareness, safety equipment, safety regulations, prevention of accidents, and appropriate use of personal technology.
  - c. Explain the impact of federal and state safety regulations (such as the Occupational Safety and Health Administration [OSHA]) on forestry operations.
2. Describe forest environmental hazards, including heat, cold, plants, insects, wildlife, and topographical hazards. <sup>DOK 2</sup>
  - a. Identify characteristics of forest insects and wildlife.
  - b. Explain signs and symptoms of exposure to insects and wildlife.
3. Demonstrate forest safety practices. <sup>DOK 2</sup>
  - a. Apply safety practices to environmental, wildlife, and topographical hazards.
  - b. Apply job site safety practices.
  - c. Discuss types and frequency of forest accidents.

## Enrichment

### Safety is as Safety does

You have been hired to be the safety officer for a large forestry division. As safety officer, you are responsible for monitoring harvesting site safety practices. Using the safety checklist, monitor job site safety practices used in forestry. Make notes about good and bad practices as well as solutions for any problems identified. Safety officers (students) will be scored based on the safety checklist in the TRD.

### Safety Regulations

Students will develop a poster that shows the various local, county, state, and federal regulations that impact forestry and forest harvesting in Mississippi. Students will be grouped into teams and scored based on the poster rubric in the TRD.

**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: Tree Growth and Stand Development

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## Competencies and Suggested Objectives

1. Explain tree physiology. <sup>DOK2</sup>
  - a. Describe the main parts of a tree, including trunk, crown, and roots along with their functions.
  - b. Describe tree respiration and photosynthesis, including respiration, transfer of water, minerals, nutrients, and production of food.
  - c. Describe environmental and biological factors that affect tree growth, including temperature, moisture, light, air, soil, tolerance, and hardiness.
  - d. Describe the methods of tree reproduction, including sprouts, seeds, and suckers.
  - e. Identify characteristics of tree growth, including height and diameter growth.
2. Explain forest stand development. <sup>DOK2</sup>
  - a. Identify stands according to classifications, including age, size, and composition.
  - b. Identify trees according to crown classes, including dominant, codominant, intermediate, and suppressed.
3. Discuss advances in biotechnology for forestry applications, including grafting, tissue culture, varieties, and genetic improvement. <sup>DOK2</sup>
4. Discuss the carbon cycle in pine plantations. <sup>DOK1</sup>

## Enrichment

### Tour Guide to the Trees

You are an urban forester for a local school district. You have been asked to teach a forestry seminar to local high school students. Take the class around and identify the factors that affect tree growth, methods of tree reproduction, and characteristics of tree growth forest stand classifications and crown classes using trees on your campus. You will guide the classroom discussion about the tree growth characteristics.

### Biotechnology Activity

You have been asked to give a lecture to a group of educators (the class) about biotechnology. Research an application of biotechnology in forestry and summarize your findings for presentation to the educators (students). Use the presentation rubric in the TRD.

## Unit 5: Dendrology

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### Competencies and Suggested Objectives

1. Explain the tree classification system. <sup>DOK 2</sup>
  - a. Identify nomenclature and taxonomy terms.
  - b. Identify common names and/or binomial names of trees, including:
    - Loblolly pine—*Pinus taeda*
    - Longleaf pine—*Pinus palustris*
    - Shortleaf pine—*Pinus echinate*
    - Slash pine—*Pinus elliotti*
    - Bald cypress—*Taxodium distichum*
    - Eastern red cedar—*Juniperus virginiana*
    - White oak—*Quercus alba*
    - Southern red oak—*Quercus falcata*
    - Swamp chestnut oak—*Quercus michauxii*
    - Water oak—*Quercus nigra*
    - Cherrybark oak—*Quercus pagoda*
    - Southern live oak—*Quercus virginiana*
    - Mockernut hickory—*Carya tomeutosa*
    - Yellow poplar—*Liriodendron tulipifera*
    - Red maple—*Acer rubrum cv.*
2. Identify trees by their characteristics. <sup>DOK 2</sup>
  - a. Describe identifying characteristics and uses of trees, including fruit, leaves, twigs, bark, and tree form.
  - b. Collect leaves, fruit, and/or bark samples of species found locally.

### Enrichment

#### Leaf Collection

Students are to collect, preserve, and display leaves and bark of a minimum of 40 local species. All specimens are to be identified by common and scientific name.

## Unit 6: Forest Traversing and Mapping

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### Competencies and Suggested Objectives

1. Explain concepts of forest traversing. <sup>DOK 2</sup>
  - a. Define terms, including bearings, acre, azimuths, chaining, boundary lines, angles, surveying, traversing, latitude, and longitude.
  - b. Describe the importance of surveying to forestry, including timber sales, land measurement, boundary marking, and mapping.
  - c. Identify characteristics of a forest survey, including use of compass, measuring distances, and mapping.
  - d. Identify surveying tools, including compass, chain (metal tape), plumb bob, and range pole.
  - e. Label parts of a compass, including magnetic needle, pivot point, housing, graduated degrees, and sighting mirror.
  - f. Identify and calculate compass measurements and symbols, including azimuths, bearings, and degrees.
2. Perform forestry surveying and mapping techniques. <sup>DOK 3</sup>
  - a. Determine the number of paces per chain using common pacing techniques.
  - b. Perform compass, pacing, and chaining skills, including completing a traverse of a selected area.
  - c. Describe and utilize new technologies for forest surveying and mapping to include Unmanned Aircraft Systems (UAS), Global Positioning Systems (GPS) and/or Geographic Information Systems (GIS), and remote sensing.
3. Calculate acreage of forest tracts. <sup>DOK 3</sup>
  - a. Determine acreage from new technologies, such as UAS, remote sensing, GPS/GIS, and/or Google Maps.
  - b. Determine acres from traditional methods such as a traverse or grid system.

### Enrichment

#### Forest Surveying

Your company was hired to survey a forest for a landowner. Demonstrate the proper techniques for pacing, chaining, and traversing within your group. Also, demonstrate the various tools used in surveying. If available, demonstrate the use of GPS in surveying.

# Unit 7: Legal Land Descriptions

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## **Competencies and Suggested Objectives**

1. Describe the United States Public Land Survey System. <sup>DOK 2</sup>
  - a. Explain and identify the principal meridians, baselines, and initial points used in Mississippi, including location of these lines on a map.
  - b. Define legal land description terms, including bearing, blaze, hack, contour, elevation, legend, plot, sea level, topographic map, and corner markers.
  - c. Explain reasons and importance for land location in forestry, including retrace, location, and layout of boundaries.
2. Identify information found on maps. <sup>DOK 2</sup>
  - a. Interpret information from and demonstrate use of ownership maps.
  - b. Interpret information from and demonstrate use of topographic maps.
  - c. Interpret information from and demonstrate use of GPS/GIS and/or internet map applications.
3. Apply principles of legal land description. <sup>DOK 2</sup>
  - a. Write, read, and locate parcels of land using legal land descriptions.
  - b. Observe the records of timber and land deeds located in the chancery clerk's office.

## **Enrichment**

### Map It Out

As a cartographer (mapmaker), you are required to label the principal meridians, baselines, and initial points on a map of Mississippi. Demonstrate your knowledge of map reading, interpretation, and labeling by completing the assignment for your employer.

### Courthouse Search

As a forester for your local timber company, you need to locate the legal description for a property you are attempting to purchase through a bidding process. Visit your local courthouse and obtain the legal land description for the property in question from the chancery clerk's office. After you have located the document, explain, discuss, and demonstrate how to write, read, and locate parcels of land using legal land descriptions.

# Unit 8: Tree and Log Measurements

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## Competencies and Suggested Objectives

1. Explain tree measurement techniques. <sup>DOK 2</sup>
  - a. Define terms, including board feet, basal area, cord, diameter at breast height (DBH), diameter, diameter inside bark (DIB), diameter outside bark (DOB), form class, 1000 board feet (MBF), merchantable height, sawlog, and sawtimber.
  - b. Identify tools used in taking tree measurements and associate them with their uses, including D-tape, tree stick, bark gauge, tree calipers, wedge prism, clinometer, and increment borer.
  - c. Classify DBH measurements into the correct diameter classes, including 1 and 2 in. classes.
  - d. Demonstrate the correct location of DBH measurements, including trees on level ground, slopes, leaning, forking, and deformed.
  - e. Identify merchantable height, including heights for sawtimber, (10-in. top for hardwood and 8-in. basic top for pine), pulpwood, and specialty products (i.e., pellets, poles, pilings, veneer, etc.).
  - f. Distinguish among the major log rules, including Doyle, Scribner, and International log rules.
  - g. Draw tally symbols, including dot-tally method.
2. Perform volume measurements of standing timber and sawlogs. <sup>DOK 3</sup>
  - a. Determine the volume of standing timber (board foot/cord volume), volume computation from DBH and height measurements and basal area.
  - b. Calculate the board foot of logs, including measuring length and DIB at small end of log to obtain volume and weight scaling of logs for volume.
  - c. Calculate the volume of standing timber using traditional methods and available technology.

## Enrichment

As owner of a forestry consulting firm, you were hired by a landowner to determine the volume of standing timber on their property using traditional methods and/or available technology. In addition to this information, you must measure and tally 10 pulpwood and 10 sawlog trees. From these 20 trees, determine the correct location of DBH measurements and include examples with the following scenarios: level ground, slopes, leaning, forking, and deformed. After these measurements have been taken, calculate the net volume of logs, including measuring length and DIB at small end of log to obtain volume and weight scaling of logs for volume. Return your findings in the form of a typed written proposal to be given to the landowner (instructor).



## Unit 9: Introduction to Timber Cruising

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### Competencies and Suggested Objectives

1. Describe procedures for cruising timber. <sup>DOK 2</sup>
  - a. Discuss terms associated with cruising, including basal area, board foot, bole, circumference, cord, cull, DBH, dendrometer, diameter, DIB, DOB, form class, hypsometer, MBF, merchantable height, sawlog, sawtimber, taper, and whorl.
  - b. Describe reasons for conducting a cruise, including management and procurement.
  - c. Describe factors that determine cruise intensity, including acreage, species, timber density, value, and purpose of cruise.
2. Perform a timber cruise. <sup>DOK 3</sup>
  - a. Describe cruising techniques.
  - b. Perform a cruise and volume calculation using traditional methods and/or available technology.

### Enrichment

#### Cruising Activity

As a forester for a local company, your assignment is to perform a 100% cruise on a plot of forest. Your performance will be evaluated using the timber cruise rubric in the TRD.

## Unit 10: Identifying Forests and Forest Products

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### Competencies and Suggested Objectives

1. Apply procedures to identify forest types. <sup>DOK 2</sup>
  - a. Define terms associated with forest types.
  - b. Distinguish between softwoods and hardwoods, including all characteristics of hardwoods and softwoods.
  - c. Identify forest regions of the United States on a map, including Pacific Coast, Rocky Mountains, Northern, Central Hardwood, Southern, and Tropical.
  - d. Identify the principal species associated with the forest regions of Mississippi, including oak-pine, oak-gum-cypress, oak-hickory, loblolly pine plantation, loblolly-shortleaf, and longleaf-slash.
2. Apply procedures to identify the physical properties of wood. <sup>DOK 2</sup>
  - a. Identify the physical properties of wood according to wood uses, including specific gravity, grain, strength, stiffness, bending, hardness, toughness, ability to be stained, and chemical properties.
  - b. Describe Mississippi wood products according to their importance to the state and local economies, including sawlogs, pulpwood products, poles and posts, veneer, furniture products, biofuels, biomass fuels, miscellaneous, and byproducts.
  - c. Describe the role of recycling in the forest products industry, including impact on forest management and harvesting practices.

### Enrichment

Divide students into groups and assign one component of the forest region to each group. The groups should research, summarize, and prepare a fact sheet to be presented to the class. Presentations will be scored based on the presentation rubric found in the TRD.

# Unit 11: Employability Skills and Leadership Development

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## Competencies and Suggested Objectives

1. Develop employability skills. <sup>DOK 1</sup>
  - a. Review group leadership skills and personal traits from Unit 2 (see associated list) and discuss how this affects employability.
  - b. Prepare a resume containing essential information, including personal information, education, and employment experience using correct grammar, spelling, and punctuation.
  - c. Complete job application forms using correct grammar, spelling, and punctuation.
  - d. Explain procedures for job interviews using correct job etiquette.
  - e. Demonstrate the role of an applicant in a job interview using correct interview procedures.
  - f. Explore job opportunities in forestry.
2. Identify FFA leadership activities associated with forestry. <sup>DOK 1</sup>
  - a. Identify FFA organizational activities that promote and recognize achievements in forestry, including personal development activities, seminars, leadership conferences, national and international exchange programs, education experience with industry, and personal and community development programs.
  - b. Identify the benefits of FFA participation to an individual and to the forestry industry, including personal growth and development, exposure to the forestry industry environment, and multicultural experiences.
  - c. Identify opportunities for members in the FFA organization, including personal development, personal recognition, travel, association with persons from other parts of the United States and abroad, career exploration, and self-expression.

## Unit 12: Forest Management Practices

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### Competencies and Suggested Objectives

1. Explain forest management practices. <sup>DOK 2</sup>
  - a. Define terms associated with forest management practices, including best management practices (BMPs) and streamside management zones (SMZs), age classifications, forest management, improvement cutting, selection cutting, timber stand improvement, stand types, and wildlife management.
  - b. Identify the role of forest management, including forest crops, management of stands, measurement of stands, goals and objectives of the landowner, and voluntary best management practices.
  - c. Describe forest management practices, including silviculture, reproduction, harvest cuttings, fertilization, and herbicide application.
  - d. Discuss the Sustainable Forestry Initiative (SFI), including BMPs and SMZs, and potential certifications in these areas.
  - e. Examine the impact of federal and state regulations on issues such as water quality and threatened and endangered species in forest operations.
2. Apply forest management practices. <sup>DOK 3</sup>
  - a. Describe the purposes of intermediate cutting in forest management, including maximizing growth, control spacing, and removal of undesirable trees.
  - b. Determine the type of intermediate cut, including precommercial, pulpwood, release, sanitation, and salvage.
  - c. Classify timber stand improvement (TSI) needs, including thinning overstocked stands, prescribed burning, fertilization, herbicide release, and sanitation and salvage cuts.

### Enrichment

Conduct a field trip to evaluate forest management practices, including BMPs and SMZs. Have students record their observations in their journal/notebook. While there, divide students into groups and assign a tract to each group to formulate a forest management plan and present the plan to the class. Use the presentation rubric found in the TRD.

## Unit 13: Advanced Timber Cruising

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<b>Competencies and Suggested Objectives</b>
1. Describe the different types of sampling techniques used in measuring standing timber, including line plot, strip, and prism cruising. <sup>DOK 2</sup>
2. Plan and conduct a timber cruise. <sup>DOK 3</sup> <ol style="list-style-type: none"><li>Prepare cruise layouts, including drawing of a diagram describing a 10% sample systematic grid.</li><li>Conduct timber cruises and determine tract volume and values, including 10%, 20%, and 100% samples.</li><li>Discuss and perform point sampling.</li></ol>
<b>Enrichment</b>
<u>Cruise Types</u> <p>A local landowner wants to know which cruise method is best for calculating his profits. Conduct a field exercise to participate in timber cruising. You and your crew (each group) will conduct a cruise of a given tract of timber. You will calculate the board footage on the tract and compare their findings to the groups. Each group will be given one of the following cruise types: fixed radius plot, point sampling, strip cruise, or 100%. Use timber cruise rubric in TRD.</p>

# Unit 14: Timber Marketing

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## Competencies and Suggested Objectives

1. Explain timber marketing procedures. <sup>DOK 2</sup>
  - a. Define terms associated with timber marketing, including harvesting compliance, management prescriptions, grantee, and grantor.
  - b. Describe marketing practices for selling at the highest return, including marking, cruising, determining the value of timber, and selling the timber for the highest price.
  - c. Identify potential markets, financial opportunities, and effects of supply and demand of the following: pulp paper mills, post mills, sawmills, specialty markets, export markets, and firewood sales.
  - d. Describe how to determine the highest value of a timber stand, including preparing a prospectus and a timber sale contract.
2. Describe conditions of sale and harvesting of timber. <sup>DOK 2</sup>
  - a. Describe legal documents used in the sale and harvesting of timber, including the prospectus, timber sale contract, timber deed, and harvesting contract.
  - b. Describe desirable postharvest land conditions which may be specified in a harvesting contract.
  - c. Describe logistics of transporting timber to markets, including proximity to the mill and its effect upon the price received by the producer.

## Enrichment

### Let's Make A Deal

You are a forester for a large paper company. You have been tasked with cruising a large tract of land. In this process, you must prepare the legal documents used in the sale and harvesting of this tract (i.e., prospectus, timber sale contract, timber deed, and harvesting contract). Within this set of documents, the landowner has requested a postharvest land condition line be placed in the harvest contract which will describe the conditions of the property at close of harvest. Also, your company requires you to provide information about logistics and transportation and their effects on timber prices. These reports will be presented to the head forester (instructor) and will be evaluated by the report rubric from the TRD.

# Unit 15: Timber Harvesting

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## Competencies and Suggested Objectives

1. Explain timber harvesting procedures. <sup>DOK 2</sup>
  - a. Define terms associated with timber harvesting, including harvesting layout, BMPs and SMZs, felling, topping, bunching, skidding, merchandising, loading areas and hauling.
  - b. Describe the methods of harvesting timber, including selection, seed tree, shelterwood, clear-cut, and row thinning.
  - c. Identify the products of harvesting, including pulpwood, sawlogs, and specialty wood products.
2. Develop a timber harvesting plan. <sup>DOK 3</sup>
  - a. Identify types of harvesting equipment, including chainsaws, cutoff saws, delimeter, flail delimeter, fellerbunchers, prehaulers, skidders, whole tree chippers, loaders, and hauling vehicles.
  - b. Observe timber harvesting operations, including total harvest, intermediate harvesting, and forest management practices.
  - c. Describe desirable postharvesting land conditions, including condition of nonmerchantable timber, dead trees, treetops, soil cover, and damage caused by logging equipment.
  - d. Develop a simple harvesting plan for a given tract of timber.

## Enrichment

### Methods of Harvesting Research

As an upstart logging company, you are in search of the best harvesting methods. Research and prepare a report on methods of harvesting timber, including selection, seed tree, shelterwood, clear-cut, and mechanical. The written report rubric in the TRD can be used to evaluate the report describing the methods of harvesting timber

### Harvesting Plan

Based on the methods you researched above, select a harvesting method and develop a harvesting plan for a tract of land for which you are bidding. The plan will be presented to the landowner (instructor) for evaluation using the presentation and/or report rubric in the TRD.

# Unit 16: Reforestation

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## Competencies and Suggested Objectives

1. Explain reforestation practices. <sup>DOK 2</sup>
  - a. Define reforestation terms, including planting tools and site preparation.
  - b. Identify the sources of tree seedlings.
  - c. Describe the methods of handling seedlings, including planting as soon as possible and keeping in cold storage.
  - d. Describe the methods of planting, including direct seeding, hand planting, and machine planting.
  - e. Describe the different types of site preparation, including roll chop, shearing, burning, chemical, piling, and bedding.
  - f. Describe the types of reforestation, including artificial and natural means.
  - g. Describe the economics of reforestation.
  - h. Identify federal and state reforestation programs available locally.
2. Perform reforestation practices. <sup>DOK 2</sup>
  - a. Plant seedlings, including using all available methods.
  - b. Perform a compliance check, including carrying out a standard Mississippi Forestry Commission compliance check.
  - c. Calculate number of seedlings per acre and associated costs needed for reforestation.

## Enrichment

### Reforestation

Divide the class into groups and have them use the internet or a textbook to research all available federal and state reforestation cost-share programs available to landowners. Have students summarize their findings into fact sheets and distribute to the class.

### Seedling Activity

You are a crew foreman on a reforestation job. Demonstrate to your crew (fellow class members) seedling planting techniques. After the project is completed, demonstrate procedures for conducting a compliance check to evaluate the planting efforts.



# Unit 17: Forest Fire Management

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Explain forest fire management practices. <sup>DOK 2</sup><ol style="list-style-type: none"><li>a. Define the terms associated with forest fires, including types of fires, fire behavior, fuels, controls, and weather conditions.</li><li>b. Identify the elements of the fire triangle, including heat, fuel, and oxygen.</li><li>c. Identify the classes of fires, including ground, surface, and crown.</li><li>d. Identify the methods of attack, including direct and indirect.</li><li>e. Identify firefighting tools according to their uses, including rakes, swatters, cutting tools, backpack sprayer, drip torch, fire plows, and new technology (i.e., UAS).</li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Apply forest fire management techniques. <sup>DOK 3</sup><ol style="list-style-type: none"><li>a. Develop a prescribed burning plan that details fire lanes, weather conditions, wind speed and direction, timber type, fuel conditions, manpower, and procedures for obtaining permission to burn.</li><li>b. Explain the significance of a certified burn manager on the site of all prescribed burns.</li><li>c. Develop a forest fire prevention plan that details fire lanes, section roads, prescribed burning, and emergency notification procedures.</li></ol></li></ol>
<b>Enrichment</b>
As a county forester, you have been asked to develop a prescribed burning plan for your service area. Create a report discussing the common elements of a prescribed burn plan to present to the county supervisors (instructor and class). In your presentation, be prepared to demonstrate the use of firefighting tools and procedures. Use written report rubric in TRD.

# Unit 18: Forest Insects and Diseases

## Competencies and Suggested Objectives

1. Identify and discuss forest insects and diseases. <sup>DOK 2</sup>
  - a. Define the terms associated with forest insects and diseases, including wood damage, leaf eaters, wood eaters, epidemic, predator, habitat, diseases, and signs of damage.
  - b. Identify the following common insects that affect the forestry industry:
    - Southern pine beetle
    - Ips engraver beetle
    - Black turpentine beetle
    - Nantucket pine tip moth
    - Fall web worm
    - Forest tent caterpillar
    - Pales weevil
    - Locust leafminer
    - Bag worm
    - Gypsy moth
  - c. Identify the following common diseases that affect the forestry industry:
    - Brown spot needle blight
    - Cedar apple gall rust
    - Needle cast
    - Heart rot
    - Oak leaf wilt
    - Verticillium wilt
    - Annosus root rot
    - Fusiform rust
    - Black knot fungus
    - Mistletoe
  - d. Identify insect and disease damage and match the damage observed to the origin.
  - e. Identify symptoms of insect or disease damage for the following: leaf eaters, wood eaters, sap eaters, phloem eaters, cone borers, root feeders, and terminal feeders.
2. Discuss control methods of forest insects and diseases. <sup>DOK 2</sup>
  - a. Describe the various methods used to control insects and diseases, including direct control and indirect control.
  - b. Identify the reasons for identifying insect and disease damage, including prevention of epidemics and loss of timber volume.
  - c. Describe aerial forest detection procedures, including UAS technology, for insect and disease problems.

## Enrichment

Collect photos of various timber insects, diseases, and associated damage. Include scientific names, common names, development stages, and control methods for each.

# 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: Exploring the World of Forestry</b>	
	1. Explain the importance of forestry.
	2. Explain careers in the field of forestry.
<b>Unit 2: Leadership Development</b>	
	1. Explain the benefits of FFA participation.
	2. Demonstrate group leadership skills and personal traits.
<b>Unit 3: Forest Safety</b>	
	1. Explain forest safety practices.
	2. Describe forest environmental hazards.
	3. Demonstrate forest safety practices.
<b>Unit 4: Tree Growth and Stand Development</b>	
	1. Explain tree physiology.
	2. Explain forest stand development.
	3. Discuss advances in biotechnology for forestry applications.
	4. Discuss the carbon cycle in pine plantations.
<b>Unit 5: Dendrology</b>	
	1. Explain the tree classification system.
	2. Identify trees by their characteristics.
<b>Unit 6: Forest Traversing and Mapping</b>	
	1. Explain concepts of forest traversing.
	2. Perform forestry surveying and mapping techniques.
	3. Calculate acreage of forest tracts.
<b>Unit 7: Legal Land Descriptions</b>	
	1. Describe the United States Public Land Survey System.
	2. Identify information found on maps.
	3. Apply principles of legal land description.

<b>Unit 8: Tree and Log Measurements</b>		
	1.	Explain tree measurement techniques.
	2.	Perform volume measurements of standing timber and sawlogs.
<b>Unit 9: Introduction to Timber Cruising</b>		
	1.	Describe procedures for cruising timber.
	2.	Perform a timber cruise.
<b>Unit 10: Identifying Forests and Forest Products</b>		
	1.	Apply procedures to identify forest types.
	2.	Apply procedures to identify the physical properties of wood.
<b>Unit 11: Employability Skills and Leadership Development</b>		
	1.	Develop employability skills.
	2.	Identify FFA leadership activities associated with forestry.
<b>Unit 12: Forest Management Practices</b>		
	1.	Explain forest management practices.
	2.	Apply forest management practices.
<b>Unit 13: Advanced Timber Cruising</b>		
	1.	Describe the different types of sampling techniques used in measuring standing timber.
	2.	Plan and conduct a timber cruise.
<b>Unit 14: Timber Marketing</b>		
	1.	Explain timber marketing procedures.
	2.	Describe conditions of sale and harvesting of timber.
<b>Unit 15: Timber Harvesting</b>		
	1.	Explain timber harvesting procedures.
	2.	Develop a timber harvesting plan.
<b>Unit 16: Reforestation</b>		
	1.	Explain reforestation practices.
	2.	Perform reforestation practices.
<b>Unit 17: Forest Fire Management</b>		
	1.	Explain forest fire management practices.
	2.	Apply forest fire management techniques.
<b>Unit 18: Forest Insects and Diseases</b>		
	1.	Identify and discuss forest insects and diseases.
	2.	Discuss control methods of forest insects and diseases.

## Appendix A: Industry Standards

## AGRICULTURE, FOOD, AND NATURAL RESOURCES (AFNR) PATHWAY CONTENT STANDARDS AND PERFORMANCE ELEMENTS

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
AFNR										
AGRIBUSINESS SYSTEMS									X	X
ANIMAL SYSTEMS		X								
BIOTECHNOLOGY					X		X	X		X
ENVIRONMENTAL SERVICE SYSTEMS		X		X	X		X	X	X	X
NATURAL RESOURCE SYSTEMS		X		X	X	X	X	X	X	X
PLANT SYSTEMS					X	X				
POWER, STRUCTURAL, AND TECHNICAL SYSTEMS								X	X	X
	Units	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
AFNR										
AGRIBUSINESS SYSTEMS				X		X				
ANIMAL SYSTEMS										
BIOTECHNOLOGY										X
ENVIRONMENTAL SERVICE SYSTEMS		X		X	X	X	X	X	X	X
NATURAL RESOURCE SYSTEMS		X		X	X	X	X	X	X	X
PLANT SYSTEMS								X		X
POWER, STRUCTURAL, AND TECHNICAL SYSTEMS							X	X		

### Agriculture, Food, and Natural Resources (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 Street, 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/).

### AGRIBUSINESS SYSTEMS

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of agribusiness systems.

**ABS.01. Apply management planning principles in AFNR businesses.**

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

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

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

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

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

ABS.02.01. 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. 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. Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.**

ABS.03.01. Develop, assess, and manage cash budgets to achieve AFNR business goals.

ABS.03.02. Analyze credit needs and manage credit budgets to achieve AFNR business goals.

**ABS.04. Develop a business plan for an AFNR business.**

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

ABS.04.02. Develop production and operational plans for an AFNR business.

ABS.04.03. Identify and apply strategies to manage or mitigate risk.

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

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

ABS.05.02. Assess and apply sales principles and skills to accomplish AFNR business objectives.

ABS.05.03. Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

**ANIMAL SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and practices to the production and management of animals

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

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

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

AS.01.03. Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.

**AS.02. Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.**

AS.02.01. Demonstrate management techniques that ensure animal welfare.

AS.02.02. Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).

**AS.03. Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction, and/or economic production.**

AS.03.01. Analyze the nutritional needs of animals.

AS.03.02. Analyze feed rations and assess if they meet the nutritional needs of animals.

AS.03.03. Utilize industry tools to make animal nutrition decisions.

**AS.04. Apply principles of animal reproduction to achieve desired outcomes for performance, development, and/or economic production.**

AS.04.01. Evaluate animals for breeding readiness and soundness.

AS.04.02. Apply scientific principles to select and care for breeding animals.

AS.04.03. Apply scientific principles to breed animals.

**AS.05. Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.**

AS.05.01. Design animal housing, equipment, and handling facilities for the major systems of animal production.

AS.05.02. Comply with government regulations and safety standards for facilities used in animal production.

**AS.06. Classify, evaluate, and select animals based on anatomical and physiological characteristics.**

AS.06.01. Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).

AS.06.02. Apply principles of comparative anatomy and physiology to uses within various animal systems.

AS.06.03. Select and train animals for specific purposes and maximum performance based on anatomy and physiology.

**AS.07. Apply principles of effective animal health care.**

AS.07.01. Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

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

**AS.08. Analyze environmental factors associated with animal production.**

- AS.08.01. Design and implement methods to reduce the effects of animal production on the environment.
- AS.08.02. Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.

## **BIOTECHNOLOGY**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to biotechnology in agriculture.

### **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. 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. 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. 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. Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations, and results.
- BS.02.02. Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.
- BS.02.03. Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.
- BS.02.04. Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.
- BS.02.05. 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. Apply biotechnology principles, techniques, and processes to create transgenic species through genetic engineering.
- BS.03.02. Apply biotechnology principles, techniques, and processes to enhance the production of food through the use of microorganisms and enzymes.
- BS.03.03. 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. Apply biotechnology principles, techniques, and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals and biodiversity, etc.).
- BS.03.05. Apply biotechnology principles, techniques, and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).
- BS.03.06. Apply biotechnology principles, techniques, and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

## **ENVIRONMENTAL SERVICE SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the management of environmental service systems.

### **ESS.01. Use analytical procedures and instruments to manage environmental service systems.**

ESS.01.01. Analyze and interpret laboratory and field samples in environmental service systems.

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

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

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

ESS.03.01. Apply meteorology principles to environmental service systems.

ESS.03.02. Apply soil science and hydrology principles to environmental service systems.

ESS.03.03. Apply chemistry principles to environmental service systems.

ESS.03.04. Apply microbiology principles to environmental service systems.

ESS.03.05. Apply ecology principles to environmental service systems.

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

ESS.04.01. Use pollution control measures to maintain a safe facility environment.

ESS.04.02. Manage safe disposal of all categories of solid waste in environmental service systems.

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

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

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

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

ESS.05.02. Perform assessments of environmental conditions using equipment, machinery, and technology.

## **NATURAL RESOURCE SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the management of natural resources.

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

NRS.01.01. Apply methods of classification to examine natural resource availability and ecosystem functions in a particular region.

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

NRS.01.03 Apply ecological concepts and principles to atmospheric natural resource systems.

NRS.01.04 Apply ecological concepts and principles to aquatic natural resource systems.

NRS.01.05 Apply ecological concepts and principles to terrestrial natural resource systems.

NRS.01.06 Apply ecological concepts and principles to living organisms in natural resource systems.

### **NRS.02.01 Analyze the interrelationships between natural resources and humans.**

NRS.02.01. 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. Assess the impact of human activities on the availability of natural resources.

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

NRS.02.04. Examine and explain how economics affects the use of natural resources.

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

### **NRS.03. Develop plans to ensure sustainable production and processing of natural resources.**

NRS.03.01. Sustainability 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. Demonstrate cartographic skills, tools, and technologies to aid in developing, implementing, and evaluating natural resource management plans.

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

- NRS.04.01. Demonstrate natural resource protection, maintenance, enhancement, and improvement techniques.
- NRS.04.02. Diagnose plant and wildlife diseases and follow protocol to prevent their spread.
- NRS.04.03. Prevent or manage introduction of ecologically harmful species in a particular region.
- NRS.04.04. Manage fires in natural resource systems.

## **PLANT SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the production and management of plants.

### **PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.**

- PS.01.01. Determine the influence of environmental factors on plant growth.
- PS.01.02. Prepare and manage growing media for use in plant systems.
- PS.01.03. Develop and implement a fertilization plan for specific plants or crops.

### **PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.**

- PS.02.01. Classify plants according to taxonomic systems.
- PS.02.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems.

### **PS.03. Propagate, culture, and harvest plants and plant products based on current industry standards.**

- PS.03.01. Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Develop and implement a management plan for plant production.
- PS.03.03. Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Harvest, handle, and store crops according to current industry standards.

### **PS.04. Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).**

- PS.04.01. Evaluating, identifying, and preparing plants to enhance an environment.

## **POWER, STRUCTURAL AND TECHNICAL SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.

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

- PST.01.01. Apply physical science laws and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.
- PST.01.02. Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.
- PST.01.03. 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. Operate and maintain AFNR mechanical equipment and power systems.**
  - PST.02.01. Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.
  - PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings.
- PST.03. Service and repair AFNR mechanical equipment and power systems.**
  - PST.03.01. Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.
  - PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.
  - PST.03.03. 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. Plan, build and maintain AFNR structures.**
  - PST.04.01. Create sketches and plans for AFNR structures.
  - PST.04.02. Determine structural requirements, specifications and estimate costs for AFNR structures.
  - PST.04.03. Follow architectural and mechanical plans to construct and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).
  - PST.04.04. Apply electrical wiring principles in AFNR structures.
- PST.05. Use control, monitoring, geospatial and other technologies in AFNR power structural and technical systems.**
  - PST.05.01. Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.
  - PST.05.02. Prepare and/or use electrical drawings to design, install, and troubleshoot electronic control systems in AFNR settings.
  - PST.05.03. Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.





## 2021 Horticulture

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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 horticulture 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. A complete copy of the standards can be accessed at [thecouncil.ffa.org/afnr](http://thecouncil.ffa.org/afnr). The National AFNR Career Cluster Content Standards are copyrighted to the National Council for Agricultural Education and are used by permission.

## **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 Ready 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

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## **Pathway Description**

Horticulture is a pathway in the agriculture, food, and natural resources career cluster. This program is designed for students who wish to pursue entry-level employment or continuing education in a wide variety of fields in the horticulture industry. Topics covered in the two-year program include plant structure and growth; plant propagation; pest management; floristry; greenhouse crops and management; olericulture; plantscaping; landscape design, installation, and management; and turfgrass management.

## **College, Career, and Certifications**

No national industry-recognized certifications are known to exist at this time in the field of horticulture. 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 a ninth grader. 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 both classroom- and 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**
    - a. 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 that should be completed in the following sequence:

1. **Introduction to Horticulture—Course Code: 991402**
2. **Horticulture Plant Processes—Course Code: 991403**
3. **Horticulture Nursery—Course Code: 991404**
4. **Horticulture Landscape and Turfgrass—Course Code: 991405**

### **Course Description: Introduction to Horticulture**

This course teaches students about horticulture orientation and leadership development. Students are introduced to basic plant and soil sciences (plant structure and growth). This course also focuses on horticulture structures.

### **Course Description: Horticulture Plant Processes**

This course focuses on plant propagation, principles of pest management, greenhouse crops, and olericulture production.

### **Course Description: Horticulture Nursery**

This course is a comprehensive course that reviews leadership, careers, and safety. It also introduces students to nursery and landscape plant identification, horticulture marketing, and business procedures, as well as container and field crop production.

### **Course Description: Horticulture Landscape and Turfgrass**

This course covers the concepts of landscape design, installation, construction, and maintenance. Students will learn skills and knowledge associated with turfgrass installation and maintenance, pomology production, and basic principles of floristry.

### **Introduction to Horticulture—Course Code: 991402**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
1	Horticulture Orientation and Leadership Development	15
2	Horticulture Safety	15
3	Basic Plant Structure and Function	35
4	Plant Media	30
5	Horticulture Structures	15
<b>Total</b>		<b>110</b>

**Horticulture Plant Processes—Course Code: 991403**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
6	Plant Propagation	35
7	Principles of Pest Management	30
8	Greenhouse Crops and Olericulture Production	40
<b>Total</b>		105

**Horticulture Nursery—Course Code: 991404**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
9	Leadership, Careers, and Safety	15
10	Nursery and Landscape Plant Identification	25
11	Horticulture Marketing and Business Procedures	30
12	Container and Field Crop Production	30
<b>Total</b>		100

**Horticulture Landscape and Turfgrass—Course Code: 991405**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
13	Landscape Design, Installation, Construction, and Maintenance	55
14	Turfgrass Installation and Maintenance	25
15	Principles of Floristry	25
16	Pomology Production	10
<b>Total</b>		115



## Option 2—Two 2-Carnegie Unit Courses

This curriculum consists of two 2-credit courses that should be completed in the following sequence:

1. **Horticulture I—Course Code: 991400**
2. **Horticulture II—Course Code: 991401**

### Course Description: Horticulture I

This course introduces students to basic plant and soil sciences (plant structure and growth). It focuses on horticulture structures, plant propagation, and principles of pest management. It also covers greenhouse crops and olericulture production.

### Course Description: Horticulture II

This course reviews leadership, careers, and safety in the horticulture field. It introduces students to plant identification, horticulture marketing and business procedures, and container and field crop production. It includes concepts of landscape design, installation, construction, and maintenance. Students are introduced to turfgrass installation and maintenance, pomology, and basic principles of floristry.

### Horticulture I—Course Code: 991400

Unit	Unit Name	Hours
1	Horticulture Orientation and Leadership Development	15
2	Horticulture Safety	15
3	Basic Plant Structure and Function	35
4	Plant Media	30
5	Horticulture Structures	15
6	Plant Propagation	35
7	Principles of Pest Management	30
8	Greenhouse Crops and Olericulture Production	40
<b>Total</b>		215

### Horticulture II—Course Code: 991401

Unit	Unit Name	Hours
9	Leadership, Careers, and Safety	15
10	Nursery and Landscape Plant Identification	25
11	Horticulture Marketing and Business Procedures	30
12	Container and Field Crop Production	30
13	Landscape Design, Installation, Construction, and Maintenance	55
14	Turfgrass Installation and Maintenance	25
15	Principles of Floristry	25
16	Pomology Production	10
<b>Total</b>		215

# Career Pathway Outlook

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## Overview

Horticulture is a science that focuses on the commercial production of specialty crops that help sustain and enrich our lives by providing nutritious food, enhancing the beauty of our homes and communities, and reducing our carbon footprint. These specialty crops include fruits, vegetables, ornamental plants, and turfgrass. A shortlist of places horticulturists may work includes labs, floral shops, arboretums, garden centers, and golf courses. Careers fields in horticulture include landscape design, golf and sports turf management, teaching, and research. Many with a background in horticulture start their own businesses.

Most careers in horticulture require at least an associate degree, although careers with the highest earning potential—scientists and postsecondary teachers, for example—usually require advanced degrees.

## Needs of the Future Workforce

Careers in horticulture are projected to grow as research into agricultural production methods and techniques continues. Data for this synopsis were compiled from employment projections prepared by the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (2020), and the Mississippi Department of Employment Security (2020).

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings (2019)
Food Scientists and Technologists	40	50	10	25	\$28.05
Agricultural and Food Science Technicians	260	270	10	3.9	\$18.18
Agricultural Sciences Teachers, Postsecondary	150	160	10	6.7	NA
Soil and Plant Scientists	110	110	0	0	\$43.61
Farm and Home Management Advisors	290	300	10	3.5	\$23.73
Landscaping and Groundskeeping Workers	6,000	6,620	620	10.3	\$12.46
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	980	1,090	110	11.2	\$18.22

Source: Mississippi Department of Employment Security; [mdes.ms.gov](https://mdes.ms.gov) (2019).

**Perkins V Requirements and Academic Infusion**

The horticulture curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in horticulture 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 horticulture. 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 horticulture 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 in Mississippi that will foster the types of learning expected from the horticulture curriculum. The National FFA Organization is the student organization for horticulture. FFA provides students with growth opportunities and competitive events and also 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 horticulture 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 horticulture 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 horticulture field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the horticulture 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 horticulture professionals. Thus, supervised collaboration and immersion into the horticulture 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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## **Suggested Time on Task**

This section indicates an estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80% of the time in the course. The remaining percentage of class time will include instruction in nontested material, review for end-of-course testing, and special projects.

## **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 horticulture 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 horticulture 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: Horticulture Orientation and Leadership Development

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<b>Competencies and Suggested Objectives</b>	
1. Identify school and program policies and procedures related to the horticulture program. <sup>DOK1</sup>	
<ul style="list-style-type: none"> <li>a. Describe local program and career technical center policies and procedures including dress code, attendance, academic requirements, discipline, the school technology acceptable use policy, and horticulture regulations.</li> <li>b. Define and describe universally accepted ethics and values as applied to horticulture careers.</li> <li>c. Practice ethics and values in the horticulture classroom and lab.</li> </ul>	
2. Develop life and career skills for success in the 21st century. <sup>DOK3</sup>	
<ul style="list-style-type: none"> <li>a. Identify, describe, and apply essential life and career skills/traits.               <ul style="list-style-type: none"> <li style="width: 50%;">• Communication</li> <li style="width: 50%;">• Loyalty</li> <li style="width: 50%;">• Considerate</li> <li style="width: 50%;">• Open-minded</li> <li style="width: 50%;">• Cooperation</li> <li style="width: 50%;">• Positive self-concept</li> <li style="width: 50%;">• Dependability</li> <li style="width: 50%;">• Problem-solver</li> <li style="width: 50%;">• Effective listening</li> <li style="width: 50%;">• Rational thinking</li> <li style="width: 50%;">• Empathy</li> <li style="width: 50%;">• Respect for others</li> <li style="width: 50%;">• Enthusiasm</li> <li style="width: 50%;">• Responsibility</li> <li style="width: 50%;">• Gets along with others</li> <li style="width: 50%;">• Self-motivated/determined</li> <li style="width: 50%;">• Good manners</li> <li style="width: 50%;">• Sets priorities</li> <li style="width: 50%;">• Honesty</li> <li style="width: 50%;">• Teamwork</li> <li style="width: 50%;">• Humility</li> <li style="width: 50%;">• Trustworthy</li> <li style="width: 50%;">• Interpersonal skills</li> <li style="width: 50%;">• Work ethic</li> </ul> </li> <li>b. Explain the role of effective leadership.</li> <li>c. Apply the concepts of team building and team member participation.</li> <li>d. Self-evaluate students' personal leadership traits and develop a plan for improvement.</li> <li>e. Demonstrate basic parliamentary procedures (e.g., conduct a meeting, state a main motion, vote on a motion, understand the use of a gavel, distinguish between types of motions [main, subsidiary, incidental, privileged, etc.]).</li> </ul>	
3. Explore the role of the FFA in promoting leadership, personal development, and human relations skills. <sup>DOK1</sup>	
<ul style="list-style-type: none"> <li>a. Explore the history and nature of the organization in promoting and developing leadership, personal development, and human relations skills.</li> <li>b. Identify career-related values and ethics promoted through the organization.</li> <li>c. Identify membership benefits.</li> <li>d. Select activities that promote personal development and leadership skills.</li> </ul>	
4. Complete a supervised agricultural experience (SAE) project.	

## Unit 2: Horticulture Safety

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### Competencies and Suggested Objectives

1. Demonstrate fundamental safety practices related to horticulture enterprises. <sup>DOK1</sup>
  - a. Identify hazards that may be found in horticulture operations, laboratories, and activities (e.g., poisons and other chemicals, sun exposure, ladders and scaffolds, electrical shock [GFI receptacles], fire, poisonous insects and snakes, equipment and tool hazards, spills, slipping, etc.).
  - b. Identify and demonstrate the use of personal protection devices, including eye protection, hearing protection, foot protection, respiratory protection, clothing and body protection, fire extinguishers (Class A, B, and C), eyewash and shower stations, first-aid kits, and other general safety equipment.

**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 3: Basic Plant Structure and Function

### Competencies and Suggested Objectives

1. Explore plant structure and their functions. <sup>DOK 2</sup>
  - a. Draw a diagram of a flowering plant, and label and describe the major parts (roots, stems, leaves, and flowers) and functions as related to plant growth (cell division, cell elongation, and cell differentiation).
  - b. Describe the process of respiration, photosynthesis, and transpiration.
  - c. Describe the relationship of environmental and cultural factors to plant growth (water, light, temperature, soil, USDA climatic zones).
2. Apply systems of plant classification. <sup>DOK1</sup>
  - a. Examine the taxonomy of plants including history, scientific classification, cultivars, and common nomenclature.
  - b. Classify plants according to life cycle, including annual, perennial, deciduous, evergreen, etc.
  - c. Interpret the scientific classification of the following shrubs:
    - Littleleaf boxwood / *Buxus microphylla* cv.
    - Common camellia / *Camellia japonica*
    - Common gardenia / *Gardenia jasminoides* 'Fortuniana'
    - Oakleaf hydrangea / *Hydrangea quercifolia*
    - Chinese holly / *Ilex cornuta* cv.
    - Japanese holly / *Ilex crenata* cv.
    - Chinese juniper / *Juniperus chinensis* cv.
    - Creeping juniper / *Juniperus horizontalis* cv.
    - Fountain grass / *Pennisetum ruppelia*
    - Lily-of-the-Valley Bush / *Pieris japonica*
    - Exbury hybrid azalea / *Rhododendron hybrid*
    - Yew / *Taxus spp. and cv.*
    - Chinese wisteria / *Wisteria sinensis* cv.
  - d. Interpret the scientific class classification of the following trees:
    - Red maple / *Acer rubrum*
    - Japanese maple / *Acer palmatum* cv.
    - River birch / *Betula nigra*
    - Redbud / *Cercis canadensis*
    - Flowering dogwood / *Cornus florida* cv.
    - Ginkgo, Maidenhair tree / *Ginkgo biloba*
    - Crape myrtle / *Lagerstroemia indica* cv.
    - Sweet gum / *Liquidambar styraciflua*
    - Tulip poplar / *Liriodendron tulipifera*
    - Southern magnolia / *Magnolia grandiflora*
    - Colorado (blue) spruce / *Picea pungens* cv.
    - Japanese black pine / *Pinus thunbergiana*

- Kwanzan Japanese flowering cherry / *Prunus serrulata* 'Kwanzan'
- White oak / *Quercus alba*
- Pin oak / *Quercus palustris*
- Red oak / *Quercus rubra*
- Bald cypress / *Taxodium distichum*

## Unit 4: Plant Media

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<p>1. Describe and apply principles of plant growth media. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Identify and compare the components of natural soil (sand, silt, and clay) and soilless mix. List and explain the characteristics each one imparts to the root medium.</li><li>b. Prepare a growing media to specifications or identify the components and proportions in a commercially prepared root medium.</li></ul>
<p>2. Describe the characteristics of an ideal growing medium, including nutrients, water- and air-holding capacity, water drainage, and potential of hydrogen (pH). <sup>DOK 1</sup></p>
<p>3. Describe the use of soilless amendments, including vermiculite, perlite, bark, organic matter, and peat moss. <sup>DOK 1</sup></p>
<p>4. Identify macronutrients and micronutrients and their effects on plant growth. <sup>DOK 2</sup></p> <ul style="list-style-type: none"><li>a. Describe the effect of excesses and deficiencies of the macronutrients (nitrogen [N], phosphorus [P], potassium [K]).</li><li>b. Predict the effect various pH levels will have on plant nutrition and growth.</li><li>c. Analyze a growing media sample for nutrient deficiencies by using the scientific method.</li><li>d. Calculate fertilizer application rates to meet nutritional requirements for a specific crop.</li><li>e. Select fertilizer application methods for different plant enterprises to include broadcasting, injection systems, incorporating into media, and side dressing.</li></ul>

## Unit 5: Horticulture Structures

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Describe the characteristics and features of different types of greenhouses. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify and compare the greenhouse structures, coverings, and auxiliary (shade house, hot beds, and cold frame) types: quonset, ridge and furrow, even span, and shade houses.</li><li>b. Describe environmental controls, including humidistat, thermostat, cooling, watering, and heating.</li><li>c. Describe the importance of light in plant growth.</li><li>d. Discuss water, fertigation, and chemigation management in growing plants.</li><li>e. Identify and describe factors to consider in establishing a floor plan for a greenhouse, including sanitation, benching, flooring, potting facilities, chemical and dry storage, and traffic patterns.</li></ol></li></ol>

## Unit 6: Plant Propagation

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Distinguish between sexual and asexual reproduction. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Describe sexual reproduction in plants.</li><li>b. Describe the conditions needed for good seed germination.</li><li>c. Plan and conduct a seed germination test.</li><li>d. Interpret information found on a seed tag.</li><li>e. Describe, discuss, or demonstrate how to propagate plants from scarified or stratified seeds.</li><li>f. Identify and describe asexual reproduction techniques using grafting, budding, cuttings (root, stem and leaf), layering, separation and division, and tissue culture methods.</li><li>g. Identify common tools, such as hand shears, and chemicals, including hormones, used in asexual reproduction and demonstrate their safe use and care.</li></ol></li></ol>

# Unit 7: Principles of Pest Management

## Competencies and Suggested Objectives

1. Assess the effects of pests on plant production. <sup>DOK2</sup>
  - a. Identify the following types of insects and describe how insect affects production, control, and integrated pest management (IPM) practices:
    - Aphid
    - Bagworm
    - Borer
    - Leaf hopper
    - Leaf miner
    - Scale
    - Spider mite
    - Snail/slug
    - Whitefly
    - White grub
  - b. Identify the following types of diseases and describe how each disease affects production, control, and IPM practices:
    - Anthracnose
    - Apple scab
    - Black spot
    - Botrytis
    - Canker
    - Cedar-apple rust
    - Crown gall
    - Fire blight
    - Powdery mildew
    - Root rot
  - c. Identify the following types of weeds and describe how each weed affects production, control, and IPM practices:
    - Annual bluegrass
    - Broadleaf plantain
    - Buckhorn plantain
    - Chickweed
    - Crabgrass
    - Dandelion
    - Henbit
    - Nutsedge
    - Oxalis
    - Purslane
    - White clover
  - d. Identify the following types of physiological problems and describe how each problem affects production, control, and IPM practices:
    - Frost-freeze injury
    - Iron deficiency
    - Leaf scorch (drought/winter burn)
    - Nitrogen deficiency
    - Pot-bound roots
    - String trimmer injury
    - 2, 4-D injury
  - e. Design an IPM plan for a designated horticulture crop.
2. Identify, describe, and apply pesticide safety procedures. <sup>DOK1</sup>
  - a. Interpret safety and first aid precautions and formulations on pesticide labels (insecticide, herbicides, rodenticide, fungicide, miticide, molluscicide, and nematicides).
  - b. Identify the following beneficial insects and discuss how they benefit plants:
    - Assassin bug
    - Beneficial nematode
    - Big-eyed bug
    - Braconid wasp
    - Mealybug destroyer
    - Praying mantis
    - Predatory stink bugs
    - Soldier beetle

- Green Lacewing
  - Lady beetles
  - Spider
  - Paper wasp
- c. Discuss the relationship between biological, chemical, cultural, and mechanical control methods.
- d. Discuss and apply general precautions for working with pesticides in relation to the requirements for pesticide applicator's certification/licensure.

# Unit 8: Greenhouse Crops and Olericulture Production

<b>Competencies and Suggested Objectives</b>	
<p>1. Describe and apply principles of greenhouse crop production. <sup>DOK2</sup></p> <p>a. Identify and produce various common species of bedding plants, including:</p> <ul style="list-style-type: none"> <li>• Coleus</li> <li>• Chrysanthemums</li> <li>• Dianthus</li> <li>• Geraniums</li> <li>• Impatiens</li> <li>• Marigold</li> <li>• Pansy</li> <li>• Petunia</li> <li>• Salvia</li> <li>• Snapdragon</li> <li>• Verbena</li> <li>• Vinca</li> <li>• Wax begonia</li> <li>• Zinnia</li> </ul> <p>b. Identify and produce various common species of foliage/interior plants, including:</p> <ul style="list-style-type: none"> <li>• African Violet</li> <li>• Angelica</li> <li>• Cacti</li> <li>• Caladiums</li> <li>• Dracaena</li> <li>• Dumbcane</li> <li>• English ivy</li> <li>• Ferns (Boston, Kimberly, Macho, Sprengeri)</li> <li>• Nephthytis</li> <li>• Orchids</li> <li>• Peace lily</li> <li>• Philodendron</li> <li>• Poinsettias</li> <li>• Schefflera</li> <li>• Snake plant</li> <li>• Spider plant</li> </ul> <p>c. Identify cultural considerations for fertilizer, water, growing medium, pest control, temperature, natural and chemical growth control and stimulation, and light control for common crops.</p>	
<p>2. Describe and apply principles of olericulture production. <sup>DOK2</sup></p> <p>a. Describe characteristics (i.e. cultural requirements, direct seeding versus transplanting, plant growth style, and growing season) of common vegetables grown for commercial production, and distinguish between warm season and cool season crops. Including:</p> <ul style="list-style-type: none"> <li>• Beans</li> <li>• Broccoli</li> <li>• Brussel sprouts</li> <li>• Cabbage</li> <li>• Carrots</li> <li>• Cauliflower</li> <li>• Chives</li> <li>• Corn</li> <li>• Cucumber</li> <li>• Eggplant</li> <li>• Garlic</li> <li>• Kale</li> <li>• Lettuce</li> <li>• Okra</li> <li>• Onions</li> <li>• Peanuts</li> <li>• Peas</li> <li>• Peppers</li> <li>• Potatoes</li> <li>• Pumpkin</li> <li>• Spinach</li> <li>• Squash</li> <li>• Tomatoes</li> </ul>	



- b. Identify and demonstrate the use of common tools and equipment used in gardening, including tillers, spreaders, sprayers, watering devices, rakes, hoes, and shovels.
- c. Identify and describe factors to consider in preparing a seedbed, including soil class and texture, use of soil amendments, and characteristics of a properly prepared seedbed.
- d. Develop a plan for an intensive culture garden including crop and variety selection, location and spacing of different crops, scheduling of crops, crop rotation, and harvesting and marketing of crops.
- e. Discuss new and emerging technologies, trends, and issues concerning the production and marketing of vegetables in Mississippi. Identify and discuss the roles of agencies and organizations that regulate the production and marketing of vegetables.

## Unit 9: Leadership, Careers, and Safety

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<b>Competencies and Suggested Objectives</b>	
1.	Review program policies, procedures, and safety rules. <sup>DOK2</sup>
2.	Practice leadership skills. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Identify and discuss fundamental parliamentary procedures for participating in a public meeting and for public speaking.</li><li>Select FFA activities that promote personal development and leadership skills.</li></ol>
3.	Complete school-to-careers activities related to horticulture. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Identify employment and career opportunities in the horticulture industry.</li><li>Investigate educational opportunities related to horticulture at the postsecondary level.</li><li>Describe national standards and certification/licensing procedures, trade organizations, associations, and unions as related to horticulture.</li></ol>
4.	Complete an SAE. <sup>DOK3</sup>

## Unit 10: Nursery and Landscape Plant Identification

### Competencies and Suggested Objectives

1. Review plant materials covered in Unit 3 (see associated list).<sup>DOK1</sup>
2. Identify and describe the use of major plants associated with nursery and landscape operations.<sup>DOK1</sup>
  - a. Identify and describe the following plants:
    - Adam's Needle (Yucca) / *Yucca filamentosa*
    - Bayberry / *Myrica pensylvanica*
    - Bearded iris / *Iris x germanica florentina cv.*
    - Border forsythia / *Forsythia x intermedia cv.*
    - Bumalda spirea / *Spiraea x bumalda*
    - Cherry laurel / *Prunus laurocerasus cv.*
    - Chinese (saucer) magnolia / *Magnolia x soulangiana cv.*
    - Common blanketflower / *Gaillardia aristata cv.*
    - Eastern white pine / *Pinus strobus*
    - Firethorn / *Pyracantha coccinea cv.*
    - Flowering crabapple / *Malus spp. and cv.*
    - Glossy abelia / *Abelia x grandiflora cv.*
    - Heavenly bamboo / *Nandina domestica*
    - Hybrid tea rose / *Rosa spp.*
    - Japanese (flowering) quince / *Chaenomeles speciosa cv.*
    - Lilyturf / *Liriope spp. cv.*
    - London planetree / *Platanus x acerifolia*
    - Mentor barberry / *Berberis x mentorensis*
    - Oregon grape / *Mahonia aquifolia cv.*
    - Plaintain lily / *Hosta x hybrida cv.*
    - Sour (black) gum / *Nyssa sylvatica*
    - Southern yew / *Podocarpus macrophyllus*
    - Thornless honeylocust / *Gleditsia triacanthos inermis cv.*
    - Washington hawthorn / *Crataegus phaenopyrum*
    - White ash / *Fraxinus americana cv.*
    - Wintercreeper / *Euonymus fortunei cv.*

# Unit 11: Horticulture Marketing and Business Procedures

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<b>Competencies and Suggested Objectives</b>	
1. Describe and apply marketing and business practices associated with horticulture operations. <sup>DOK2</sup>	
<ul style="list-style-type: none"> <li>a. Maintain an inventory of plants and supplies for the horticulture program (ongoing throughout the year).</li> <li>b. Develop an annual calendar of activities/enterprises for a horticulture business, including ordering materials/supplies for an enterprise.</li> <li>c. Describe factors to consider in pricing products of an enterprise and complete a sales transaction that includes providing customer service.</li> <li>d. Describe factors to consider in marketing and advertising products.</li> </ul>	
2. Review basic employee responsibilities and how to communicate effectively in on-the-job situations. <sup>DOK3</sup>	
<ul style="list-style-type: none"> <li>a. Describe the following life skills:               <ul style="list-style-type: none"> <li>• Communication</li> <li>• Considerate</li> <li>• Cooperation</li> <li>• Dependability</li> <li>• Effective listening</li> <li>• Empathy</li> <li>• Enthusiasm</li> <li>• Gets along with others</li> <li>• Good manners</li> <li>• Honesty</li> <li>• Humility</li> <li>• Interpersonal skills</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Loyalty</li> <li>• Open-mindedness</li> <li>• Positive self-concept</li> <li>• Problem-solving</li> <li>• Rational thinking</li> <li>• Respect for others</li> <li>• Responsibility</li> <li>• Self-motivated/determined</li> <li>• Sets priorities</li> <li>• Teamwork</li> <li>• Trustworthy</li> <li>• Work ethic</li> </ul>
3. Discuss and explore business operations. <sup>DOK2</sup>	
<ul style="list-style-type: none"> <li>a. Marketing's four Ps (price, product, place, promotion)</li> <li>b. Forms of business organizations (sole proprietorship, corporations, partnerships, limited liability companies)</li> <li>c. Sources of capital (wholesale versus retail)</li> </ul>	

## Unit 12: Container and Field Crop Production

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### Competencies and Suggested Objectives

1. Describe and apply principles of container and field crop production. <sup>DOK2</sup>
  - a. Describe advantages and disadvantages of container crop production versus field crop production.
  - b. Identify and demonstrate the safe use of tools and equipment for container and field crop production. Include the following:
    - Ball cart (B&B truck)
    - Broadcast (cyclone) spreader
    - Burlap
    - Drip emitter, irrigation
    - Duster
    - Dust mask
    - Fertilizer tablet
    - Grafting tool
    - Granular fertilizer
    - Ground/pelleted limestone
    - Hearing protection
    - Hose-end repair fitting
    - Hose-end sprayer
    - Hose-end washer
    - Hose repair coupling
    - Impact sprinkler
    - Measuring wheel
    - Mist nozzle (mist bed)
    - Nursery container
    - Planting/earth/soil auger
    - Propagation mat
    - PVC (polyvinylchloride) pipe
    - Resin-coated fertilizer
    - Safety goggles
    - Soil sampling tube
    - Solenoid valve
    - Spray suit
    - Tape measure
    - Tree caliper
    - Tree wrap
    - Water breaker
  - c. Describe automation and plug production in the nursery industry.
  - d. Describe and contrast the different types of nursery irrigation systems.

## Unit 13: Landscape Design, Installation, Construction, and Maintenance

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### Competencies and Suggested Objectives

1. Describe and apply principles of landscape design. <sup>DOK2</sup>
  - a. Describe careers in the landscape design field.
  - b. Identify and demonstrate the use of tools and equipment for landscape design, including computer-assisted landscape design hardware and software.
  - c. Identify and demonstrate the methods of lettering and symbols used in landscape design plans.
  - d. Describe principles of design and design processes associated with landscaping, including simplicity, balance, and proportion.
  - e. Prepare a simple landscape plan to scale for a given site, including plant selection and location.
2. Describe and apply basic principles of landscape installation and construction. <sup>DOK2</sup>
  - a. Prepare site analysis/needs assessment for a given site.
  - b. Identify and demonstrate the safe use of equipment, materials, and hand tools for landscape maintenance, including:
 

<ul style="list-style-type: none"> <li>• Bark mulch</li> <li>• Bow saw</li> <li>• Compressed air sprayer</li> <li>• Chain saw</li> <li>• Edger (power or hand)</li> <li>• Edging</li> <li>• Erosion netting</li> <li>• Garden (spading) fork</li> <li>• Garden (bow) rake</li> <li>• Garden hoe</li> <li>• Gas mask</li> <li>• Gravity (drop) spreader</li> <li>• Hearing protection</li> <li>• Hedge shears</li> <li>• Hook-and-blade pruners</li> <li>• Landscape fabric</li> <li>• Leaf rake</li> <li>• Loppers</li> <li>• Mattock</li> <li>• Pickaxe</li> <li>• Pole pruner</li> </ul>	<ul style="list-style-type: none"> <li>• Polyethylene pipe</li> <li>• Pop-up irrigation head</li> <li>• Post-hole digger</li> <li>• Power blower</li> <li>• Power hedge trimmer</li> <li>• Pruning saw</li> <li>• Reel mower</li> <li>• Respirator</li> <li>• Rotary mower</li> <li>• Rototiller</li> <li>• Round point shovel</li> <li>• Scoop shovel</li> <li>• Shade fabric</li> <li>• Sharpening stone</li> <li>• Siphon proportioner</li> <li>• Soaker hose</li> <li>• Spade</li> <li>• Square point (flat) shovel</li> <li>• String trimmer</li> <li>• Trowel</li> <li>• T-square</li> </ul>
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  - c. Discuss the essential elements of a landscape installation contract including the warranty and an estimate.
  - d. Develop a contract and pricing estimate for the landscape plan.

<ul style="list-style-type: none"><li>e. Describe and discuss procedures for preparing a planting site, installing plants, and providing posttransplant care according to a landscape plan.</li><li>f. Describe licensing requirements for landscape installation.</li><li>g. Discuss installation and maintenance of a landscape irrigation system.</li></ul>
<ul style="list-style-type: none"><li>3. Describe and apply principles of landscape maintenance. <sup>DOK2</sup><ul style="list-style-type: none"><li>a. Identify and discuss the proper procedures for pruning trees and shrubs.</li><li>b. Demonstrate the proper procedure for taking a soil sample.</li><li>c. Determine and discuss a cost estimate for fertilizer, pest control, and maintenance of trees, shrubs, and beds.</li></ul></li></ul>

# Unit 14: Turfgrass Installation and Maintenance

## Competencies and Suggested Objectives

1. Describe and apply principles of turfgrass installation. <sup>DOK2</sup>
  - a. Describe factors to consider in selecting a turfgrass for a specific area. Identify varieties of turfgrass and describe their characteristics. Include the following:
    - Bentgrass
    - Bermuda grass
    - Carpet grass
    - Centipede grass
    - Kentucky bluegrass
    - St. Augustine grass
    - Tall fescue
    - Zoysia
  - b. Describe installation practices for different turfgrasses, including site preparation and initial care.
2. Describe and apply principles of turfgrass maintenance. <sup>DOK2</sup>
  - a. Identify and demonstrate the safe use and maintenance of equipment and tools used for turfgrass maintenance, including mower types, dethatchers, aerators, and other equipment.
  - b. Use mowers, sprayers, or spreaders for a specific grass.
  - c. Identify and describe common turfgrass insects, including:
    - Army worms
    - Chinch bug
    - Japanese beetle
    - Sod webworm
    - White grubs
    - Mole cricket
  - d. Identify and describe common turfgrass diseases, including:
    - Brown patch
    - Damping off
    - Dollar spot
    - Fairy ring
    - Grey leaf spot
    - Melting out
    - Pythium blight
    - Rust
    - Slime mold
    - Spring dead spot
  - e. Identify and describe common turfgrass weeds, including:
    - Annual Bluegrass
    - Bahia grass
    - Broadleaf Plantain
    - Buckhorn Plantain
    - Common bermuda grass
    - Common chickweed
    - Common purslane
    - Curly dock
    - Cutleaf geranium
    - Dallisgrass
    - Dandelion
    - Goose grass
    - Henbit
    - Large crabgrass
    - Lawn burweed
    - Mouse-ear chickweed
    - Purple nutsedge
    - Smooth crabgrass
    - Smutgrass
    - Virginia buttonweed
    - White clover
    - Wild garlic
    - Wild onion
    - Wood sorrel
    - Yellow foxtail
    - Yellow nutsedge



- d. Identify and describe common irrigation methods for turfgrass.
- e. Perform cultural practices, including aeration and dethatching.
- f. Develop a plan/cost estimate for a turfgrass management program.

## Unit 15: Principles of Floristry

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Describe and apply principles of floristry. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Demonstrate the procedures for receiving and storing (including the rotation of inventory) of floral materials.</li><li>b. Apply basic elements of design with examples that include line, filler, form, and mass.</li><li>c. Apply basic principles of design to include balance, transition, rhythm, focal point, proportion, and scale to achieve unity.</li><li>d. Receive and process orders for floral products, including seasonal and event applications.</li><li>e. Identify and demonstrate the safe and proper use of tools and supplies used in floristry, including shears, tape, foam, floral wire, and knives. Include plant materials (potted, flower, and foliage materials) used in floristry in these demonstrations.</li></ol></li></ol>

## Unit 16: Pomology Production

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### Competencies and Suggested Objectives

1. Describe and apply principles of fruit and berry production. <sup>DOK2</sup>
  - a. Identify, discuss, and prepare a planting plan, cultural plan and marketing plan of common fruits and berries produced in Mississippi to include the following:
    - Apples
    - Blackberries
    - Blueberries
    - Cantaloupes
    - Figs
    - Melons
    - Muscadines
    - Oranges
    - Peaches
    - Pears
    - Persimmons
    - Plums
    - Pumpkins
    - Raspberries
    - Strawberries
    - Watermelons
  - b. Identify, discuss, and describe the local marketing of fruits and vegetables as it relates to state, national, and international organizations that impact fruit and berry production.

# 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: Horticulture Orientation and Leadership Development</b>		
	1.	Identify school and program policies and procedures related to the horticulture program.
	2.	Develop life and career skills for success in the 21st century.
	3.	Explore the role of the FFA in promoting leadership, personal development, and human relations skills.
	4.	Complete a supervised agricultural experience (SAE) project.
<b>Unit 2: Horticulture Safety</b>		
	1.	Demonstrate basic and fundamental safety practices related to horticulture enterprises.
<b>Unit 3: Basic Plant Structure and Function</b>		
	1.	Explore plant structure and their functions.
	2.	Apply systems of plant classification.
<b>Unit 4: Plant Media</b>		
	1.	Describe and apply principles of plant growth media.
	2.	Describe the characteristics of an ideal growing medium, including nutrients, water- and air-holding capacity, water drainage, and potential of hydrogen (pH).
	3.	Describe the use of soilless amendments, including vermiculite, perlite, bark, organic matter, and peat moss.
	4.	Identify macronutrients and micronutrients and their effects on plant growth.
<b>Unit 5: Horticulture Structures</b>		
	1.	Describe the characteristics and features of different types of greenhouses.
<b>Unit 6: Plant Propagation</b>		
	1.	Distinguish between sexual and asexual reproduction.
<b>Unit 7: Principles of Pest Management</b>		
	1.	Assess the effects of pests on plant production.
	2.	Identify, describe, and apply pesticide safety procedures.

<b>Unit 8: Greenhouse Crops and Olericulture Production</b>		
	1.	Describe and apply principles of greenhouse crop production.
	2.	Describe and apply principles of olericulture production.
<b>Unit 9: Leadership, Careers, and Safety (Ongoing Review and Reinforcement)</b>		
	1.	Review program policies, procedures, and safety rules.
	2.	Practice leadership skills.
	3.	Complete school-to-careers activities related to horticulture.
	4.	Complete an SAE.
<b>Unit 10: Nursery and Landscape Plant Identification</b>		
	1.	Review plant materials covered in Unit 3 (see associated list).
	2.	Identify and describe the use of major plants associated with nursery and landscape operations.
<b>Unit 11: Horticulture Marketing and Business Procedures</b>		
	1.	Describe and apply marketing and business practices associated with horticulture operations.
	2.	Review basic employee responsibilities and how to communicate effectively in on-the-job situations.
	3.	Discuss and explore business operations.
<b>Unit 12: Container and Field Crop Production</b>		
	1.	Describe and apply principles of container and field crop production.
<b>Unit 13: Landscape Design, Installation, Construction, and Maintenance</b>		
	1.	Describe and apply principles of landscape design.
	2.	Describe and apply basic principles of landscape installation and construction.
	3.	Describe and apply principles of landscape maintenance.
<b>Unit 14: Turfgrass Installation and Maintenance</b>		
	1.	Describe and apply principles of turfgrass installation.
	2.	Describe and apply principles of turfgrass maintenance.
<b>Unit 15: Principles of Floristry</b>		
	1.	Describe and apply principles of floristry.
<b>Unit 16: Pomology Production</b>		
	1.	Describe and apply principles of fruit and berry production.

# Appendix A: Industry Standards

## AFNR National Standards

Crosswalk for Horticulture																	
	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16
ABS.01									X			X		X	X	X	X
ABS.02												X		X	X	X	X
ABS.03												X		X	X	X	X
ABS.04												X		X	X	X	X
ABS.05									X			X		X	X	X	X
ESS.01																	
ESS.02								X	X								X
ESS.03								X	X								
ESS.04			X						X								
ESS.05			X						X				X				X
FPP.01									X								X
FPP.02									X								X
FPP.03									X								X
FPP.04									X								X
NRS.01					X	X			X						X		X
NRS.02									X						X		
NRS.03									X						X		X
NRS.04								X	X						X		X
PS.01				X	X	X	X		X		X		X		X		
PS.02				X	X	X	X		X		X		X		X	X	
PS.03					X	X	X	X	X				X		X	X	
PS.04						X	X		X				X	X	X	X	
PST.01									X								X
PST.02			X						X				X	X			
PST.03			X						X				X	X			
PST.04						X			X				X	X	X		
PST.05									X					X	X		

### Agriculture, Food, and Natural Resources (AFNR) Pathway Content Standards and Performance Elements

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## **AGRIBUSINESS SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of agribusiness systems.

### **ABS.01. Apply management planning principles in AFNR businesses.**

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

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

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

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

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

ABS.02.01. 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. 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. Manage cash budgets, credit budgets, and credit for an AFNR business using generally accepted accounting principles.**

ABS.03.01. Develop, assess, and manage cash budgets to achieve AFNR business goals.

ABS.03.02. Analyze credit needs and manage credit budgets to achieve AFNR business goals.

### **ABS.04. Develop a business plan for an AFNR business.**

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

ABS.04.02. Develop production and operational plans for an AFNR business.

ABS.04.03. Identify and apply strategies to manage or mitigate risk.

### **ABS.05. Use sales and marketing principles to accomplish AFNR business objectives.**

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

ABS.05.02. Assess and apply sales principles and skills to accomplish AFNR business objectives.

ABS.05.03. Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.

## **ENVIRONMENTAL SERVICE SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the management of environmental service systems.

### **ESS.01. Use analytical procedures and instruments to manage environmental service systems.**

ESS.01.01. Analyze and interpret laboratory and field samples in environmental service systems.

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

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

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

ESS.03.01. Apply meteorology principles to environmental service systems.

ESS.03.02. Apply soil science and hydrology principles to environmental service systems.

ESS.03.03. Apply chemistry principles to environmental service systems.

ESS.03.04. Apply microbiology principles to environmental service systems.

ESS.03.05. Apply ecology principles to environmental service systems.

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

ESS.04.01. Use pollution control measures to maintain a safe facility environment.

ESS.04.02. Manage safe disposal of all categories of solid waste in environmental service systems.

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

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

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

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

ESS.05.02. Perform assessments of environmental conditions using equipment, machinery, and technology.



## **FOOD PRODUCTS AND PROCESSING SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles, practices, and techniques in the processing, storage, and development of food products.

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

FPP.01.01. Analyze and manage operational and safety procedures in food products and processing facilities.

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

FPP.01.03. Apply food safety procedures when storing food products to ensure food quality.

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

FPP.02.01. 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. 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. 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. Select and process food products for storage, distribution, and consumption.**

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

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

FPP.03.03. Create food distribution plans and procedures to ensure safe delivery of food products.

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

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

FPP.04.02. 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. Identify and explain the purpose of industry organizations, groups, and regulatory agencies that influence the local and global food systems.

## **NATURAL RESOURCE SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the management of natural resources.

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

NRS.01.01. Apply methods of classification to examine natural resource availability and ecosystem functions in a particular region.

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

NRS.01.03. Apply ecological concepts and principles to atmospheric natural resource systems.

NRS.01.04. Apply ecological concepts and principles to aquatic natural resource systems.

NRS.01.05. Apply ecological concepts and principles to terrestrial natural resource systems.

NRS.01.06. Apply ecological concepts and principles to living organisms in natural resource systems.

### **NRS.02.01. Analyze the interrelationships between natural resources and humans.**

NRS.02.01. 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. Assess the impact of human activities on the availability of natural resources.

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

NRS.02.04. Examine and explain how economics affects the use of natural resources.

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

### **NRS.03. Develop plans to ensure sustainable production and processing of natural resources.**

NRS.03.01. Sustainability 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. Demonstrate cartographic skills, tools, and technologies to aid in developing, implementing, and evaluating natural resource management plans.

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

- NRS.04.01. Demonstrate natural resource protection, maintenance, enhancement, and improvement techniques.
- NRS.04.02. Diagnose plant and wildlife diseases and follow protocol to prevent their spread.
- NRS.04.03. Prevent or manage introduction of ecologically harmful species in a particular region.
- NRS.04.04. Manage fires in natural resource systems.

## **PLANT SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the production and management of plants.

### **PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.**

- PS.01.01. Determine the influence of environmental factors on plant growth.
- PS.01.02. Prepare and manage growing media for use in plant systems.
- PS.01.03. Develop and implement a fertilization plan for specific plants or crops.

### **PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.**

- PS.02.01. Classify plants according to taxonomic systems.
- PS.02.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
- PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems.

### **PS.03. Propagate, culture, and harvest plants and plant products based on current industry standards.**

- PS.03.01. Demonstrate plant propagation techniques in plant system activities.
- PS.03.02. Develop and implement a management plan for plant production.
- PS.03.03. Develop and implement a plan for integrated pest management for plant production.
- PS.03.04. Apply principles and practices of sustainable agriculture to plant production.
- PS.03.05. Harvest, handle, and store crops according to current industry standards.

### **PS.04. Apply principles of design in plant systems to enhance an environment (e.g., floral, forest landscape, and farm).**

- PS.04.01. Evaluating, identifying, and preparing plants to enhance an environment.

## **POWER, STRUCTURAL AND TECHNICAL SYSTEMS**

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.

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

- PST.01.01. Apply physical science laws and engineering principles to assess and select energy sources for AFNR power, structural and technical systems.
  - PST.01.02. Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.
  - PST.01.03. 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. Operate and maintain AFNR mechanical equipment and power systems.**
- PST.02.01. Perform preventative maintenance and scheduled service to maintain equipment, machinery, and power units used in AFNR settings.
  - PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings.
- PST.03. Service and repair AFNR mechanical equipment and power systems.**
- PST.03.01. Troubleshoot, service, and repair components of internal combustion engines using manufacturers' guidelines.
  - PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.
  - PST.03.03. 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. Plan, build and maintain AFNR structures.**
- PST.04.01. Create sketches and plans for AFNR structures.
  - PST.04.02. Determine structural requirements, specifications and estimate costs for AFNR structures.
  - PST.04.03. Follow architectural and mechanical plans to construct and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).
  - PST.04.04. Apply electrical wiring principles in AFNR structures.
- PST.05. Use control, monitoring, geospatial, and other technologies in AFNR power structural and technical systems.**
- PST.05.01. Apply computer and other technologies (e.g., robotics, CNC, UAS, etc.) to solve problems and increase the efficiency of AFNR systems.
  - PST.05.02. Prepare and/or use electrical drawings to design, install, and troubleshoot electronic control systems in AFNR settings.
  - PST.05.03. Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.





## 2021 Food Products (Meats)

Program CIP: 01.0401 – Agricultural and Food Products Processing

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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 food products (meats) 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. A complete copy of the standards can be accessed at [thecouncil.ffa.org/afnr/](http://thecouncil.ffa.org/afnr/) The National AFNR Career Cluster Content Standards are copyrighted to the National Council for Agricultural Education and are used by permission.

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

Reprinted with permission from *ISTE Standards for Students* (2016). All rights reserved. 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 Ready 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**

Food products (meats) is a pathway in the agriculture, food, and natural resources career cluster. This program is designed for students who wish to seek employment or continued education in the meat cutting, packing, and processing professions.

## **College, Career, and Certifications**

After successful completion and mastery of these competencies, students should be equipped with essential knowledge and skills necessary to secure educational and employment opportunities in meat processing, safety, sanitation, inspection, equipment, and facility maintenance. Competencies and suggested performance indicators in the Food Products (Meats) course have been correlated to the National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards. The AFNR standards 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 a ninth grader. 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 CTE 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. **Food Products (Meats): Fundamentals—Course Code: 991202**
2. **Food Products (Meats): Custom Operations—Course Code: 991203**
3. **Food Products (Meats): Basic Meats Processing—Course Code: 991204**
4. **Food Products (Meats): Advanced Meats Processing—Course Code: 991205**

### **Course Description: Food Products (Meats): Fundamentals**

This course allows an individual to prepare for employment or continued education in the meat cutting, packing, and processing professions. Topics include orientation to meat processing, safety, sanitation, equipment, and facility maintenance.

### **Course Description: Food Products (Meats): Custom Operations**

This course allows an individual to prepare for employment or continued education in the meat cutting, packing, and processing professions. Topics include custom livestock slaughter, pricing, wrapping, and marketing.

### **Course Description: Food Products (Meats): Basic Meats Processing**

This course allows an individual to prepare for employment or continued education in the meat cutting, packing, and processing professions. Topics include identification and fabrication of carcass beef, box pork, carcass lamb and goat.

### **Course Description: Food Products (Meats): Advanced Meats Processing**

This course allows an individual to prepare for employment or continued education in the meat cutting, packing, and processing professions. Topics include identification and fabrication of poultry and fish wild game, automated processing of meats quality and yield grading, curing, smoking, and sausage making.

**Food Products (Meats): Fundamentals—Course Code: 991202**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
1	Careers and Leadership	35
2	Orientation to Meat Processing	15
3	Safety, Sanitation, Equipment, and Facility Maintenance	75
<b>Total</b>		125

**Food Products (Meats): Custom Operations—Course Code: 991203**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
4	Custom Livestock Slaughter	40
5	Pricing, Wrapping, and Marketing	23
6	Special Topics in Food Products (Meats) I	32
<b>Total</b>		95

**Food Products (Meats): Basic Meats Processing—Course Code: 991204**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
7	Identification and Fabrication of Carcass and Box Beef	60
8	Identification and Fabrication of Carcass and Box Pork	37
9	Identification and Fabrication of Carcass Lamb and Goat	15
<b>Total</b>		112

**Food Products (Meats): Advanced Meats Processing—Course Code: 991205**

<b>Unit</b>	<b>Unit Name</b>	<b>Hours</b>
10	Identification and Fabrication of Poultry and Fish	10
11	Identification and Fabrication of Wild Game	25
12	Automated Processing of Meats	10
13	Quality and Yield Grading	20
14	Curing, Smoking, and Sausage Making	15
15	Special Topics in Food Products (Meats) II	20
<b>Total</b>		100

## Option 2—(Two) 2-Carnegie Unit Courses

This curriculum consists of two 2-credit courses, which should be completed in the following sequence:

1. **Food Products (Meats) I—Course Code: 991200**
2. **Food Products (Meats) II—Course Code: 991201**

### Course Description: Food Products (Meats) I

This course is an instructional program that orients an individual to the field of meat processing, marketing, and merchandising. This course allows an individual to prepare for employment or continued education in the meat cutting, packing, and processing professions. Topics include careers, leadership, and orientation, safety, sanitation, equipment, and facility maintenance, livestock slaughter procedures, and pricing, wrapping, and marketing meats.

### Course Description: Food Products (Meats) II

This course is a continuation of Food Products (Meats) I. This course allows an individual to prepare for employment or continued education in the meat cutting, packing, and processing professions. Topics include meat cutting, automated processing, quality and yield grading, and curing, smoking, and sausage making.

### Food Products (Meats) I—Course Code: 991200

Unit Number	Unit Name	Hours
1	Careers and Leadership	35
2	Orientation to Meat Processing	15
3	Safety, Sanitation, Equipment, and Facility Maintenance	75
4	Custom Livestock Slaughter	40
5	Pricing, Wrapping, and Marketing	23
6	Special Topics in Food Products (Meats) I	32
<b>Total</b>		220

### Food Products (Meats) II—Course Code: 991201

Unit	Unit Title	Hours
7	Identification and Fabrication of Carcass and Box Beef	60
8	Identification and Fabrication of Carcass and Box Pork	37
9	Identification and Fabrication of Carcass Lamb and Goat	15
10	Identification and Fabrication of Poultry and Fish	10
11	Identification and Fabrication of Wild Game	25
12	Automated Processing of Meats	10
13	Quality and Yield Grading	20
14	Curing, Smoking, and Sausage Making	15
15	Special Topics in Food Products (Meats) II	20
<b>Total</b>		212



# Career Pathway Outlook

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## Overview

The food products (meats) curriculum prepares students for various occupations involving food science and meat processing. Occupations in this field range from researching ways to improve the efficiency and safety of food production to cutting, trimming, and packaging meat for retail sale. Most butchers and meat cutters work in grocery stores. Training for simple meat cutting may take only a few weeks. However, more complicated cutting tasks generally require training that may last from several months to more than a year. Food scientists and technologists work in laboratories, in offices, and in the field. Food scientists need at least a bachelor's degree from an accredited postsecondary institution, although many get advanced degrees. Food science technicians typically need an associate degree in biology, chemistry, crop or animal science, or a related field.

## Needs of the Future Workforce

Employment for food scientists and technologists in Mississippi is expected to grow by 25 percent by 2026. Data for this synopsis were compiled from employment projections prepared by the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (2019), and the Mississippi Department of Employment Security (2019).

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2019
Butchers and Meat Cutters	230	240	10	4.4	\$13.15
Meat, Poultry, and Fish Cutters and Trimmers	6,340	6,410	70	1.1	\$12.50
Slaughterers and Meat Packers	1,710	1,750	40	2.3	\$12.39
Food Scientists and Technologists	40	50	10	25.0	\$28.05

Source: Mississippi Department of Employment Security; mdes.ms.gov (2019).

## Perkins V Requirements and Academic Infusion

The food products (meats) curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations. 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 the food production industry. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, the curriculum 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 food products (meats) 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—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 food products (meats) curriculum. FFA is the student organization with many outlets for Agriculture. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of agricultural 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 food products (meats) 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 food products (meats) curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the food products (meats) curriculum that will allow and encourage collaboration with professionals currently in the food products (meats) field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the food products (meats) 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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American Association for Agricultural Education (AAAE)

[aaaeonline.org](http://aaaeonline.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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## **Suggested Time on Task**

This section indicates an estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80% of the time in the course. The remaining percentage of class time will include instruction in non-tested material, review for end-of-course testing, and special projects.

## **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 food products (meats) 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 food products (meats) 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: Careers and Leadership

---

## Competencies and Suggested Objectives

1. Identify career opportunities in meat cutting, packing, and processing professions. <sup>DOK1</sup>
  - a. Define *meat cutter*.
  - b. Research the major categories of job classifications in the meat cutting, packing, and processing profession.
2. Explain the benefits of FFA participation. <sup>DOK 1</sup>
  - a. Identify FFA organizational activities that promote and recognize achievements in meat cutting, packing, and processing. <sup>DOK1</sup>
  - b. Identify FFA organizational activities that promote leadership development including career development events, leadership conferences, national and international exchange programs, education experience with industry, and personal and community development programs.
  - c. Identify opportunities for members in FFA, including personal development, personal recognition, career exploration, and self-expression.
  - d. Identify the benefits of FFA participation to an individual and to the meat cutting, packing, and processing industry, including personal growth and development, exposure to the meat industry environment, and multicultural experiences.
3. Demonstrate group leadership skills and personal traits. <sup>DOK 2</sup>

• Communication	• Positive self-concept
• Considerate	• Problem-solving
• Cooperation	• Punctuality
• Dependability	• Rational thinking
• Effective listening	• Resilience
• Empathy	• Respect for others
• Enthusiasm	• Responsibility
• Getting along with others	• Responsible use of social media
• Good manners	• Safety conscious
• Honesty	• Self-motivated/determined
• Humility	• Setting priorities
• Interpersonal skills	• Teamwork
• Loyalty	• Trustworthy
• Open-minded	• Work ethic

## Enrichment

### Future President Scenario

You are the FFA president and need to present to a group of middle school students on the FFA. Prepare a 2-3-minute speech on the benefits of FFA. Prepare the speech according to the FFA guidelines for speeches (impromptu, extemporaneous, etc.) The class will peer review the speech and discuss clarity and content. Use the oral report rubric in the teacher resource document.

## Unit 2: Orientation to Meat Processing

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<b>Competencies and Suggested Objectives</b>
1. Explain trends in slaughtering and processing in the past and in the future. <sup>DOK 1</sup> a. Compare trends in slaughtering and processing 20 years in the past and in the future. b. Discuss emerging technologies related to slaughtering and meat processing.
2. Describe factors affecting consumer food spending. <sup>DOK 2</sup> a. Describe factors affecting consumer food spending to include income, geographic area, ethnic groups, and religious groups. b. Discuss biological health hazards, such as chronic wasting disease (CWD), and their effects on consumer spending.
<b>Enrichment</b>
<u>Market Scenario</u> You just bought a retail meat market that is outdated. You need to research current trends and technologies to meet consumer demands and make your shop successful.

## Unit 3: Safety, Sanitation, Equipment, and Facility Maintenance

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<b>Competencies and Suggested Objectives</b>	
1.	Explain general meat laboratory safety requirements. <sup>DOK 2</sup> a. List and practice safety rules and procedures.
2.	Discuss sanitation as it applies to a meat cutting facility. <sup>DOK 3</sup> a. Describe sanitary operation of a meat cutting facility. b. Describe proper donning and doffing of personal protective equipment while in the laboratory setting. c. Describe state and federal inspection guidelines as they apply to meat processing facilities, including ways to avoid fecal contamination. d. Identify correct temperatures for meat processing and storage and explain the importance of each. e. Describe the benefits of a rail system. f. Select and use proper aprons, disposable gloves, hard hats, eye protection, hair nets, rubber boots, etc. g. Disinfect aprons and rubber boots after each use.
3.	Discuss federal regulations related to meat processing. <sup>DOK 2</sup> a. Discuss HACCP (Hazards Analysis Critical Control Point) as a method to prevent foodborne illness. b. Discuss the role of the USDA Food Safety and Inspection Service related to quality assurance.
4.	Identify and safely use equipment for meat cutting, packing, and processing. <sup>DOK 2</sup> a. Identify equipment used in a meat laboratory, including a band saw, grinder, mixer, tenderizer, slicing machine, and stuffer. b. Safely assemble and disassemble equipment, including band saw, grinder, mixer, tenderizer, slicing machine, and stuffer. c. Identify, safely use, and sanitize other meat cutting equipment including knives, knife sharpener, steel and hone, stockinette, dead lock and tag, scales and weighing items, vacuum packer, salinometer, squeegee equipment, patty machine, heat seal, cooler, freezer, rail system, tables, hoist, skinning knife, and carcass split saw. d. Use sterilizer for knives and steel.
5.	Demonstrate equipment maintenance used in a meat cutting facility. <sup>DOK 2</sup> a. Maintain a sharp knife including boning and butcher knives. b. Perform equipment and maintenance procedures for grinder, slicer, and band saw. c. Use proper disinfection procedures for cleaning tables after use. d. Demonstrate proper hand washing procedure before and after working in the meat cutting laboratory.

6. Maintain a safe and sanitary facility. <sup>DOK 2</sup>
  - a. Wash and disinfect walls and floors.
  - b. Maintain a safe environment by wiping up spills, keeping aisles clear, and performing other tasks.

### **Enrichment**

#### Safety and Sanitation

As the owner of a new meat market, the meat inspectors are disapproving because you do not have any safety or sanitation plans in place. You need to develop a HACCP plan to ensure your shop is safe and clean in order to open your business. Use the written report rubric from the teacher resource document for guidance.

**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: Custom Livestock Slaughter

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### Competencies and Suggested Objectives

1. Explain terms and procedures associated with livestock slaughter. <sup>DOK1</sup>
  - a. Define terms and procedures associated with the slaughter of beef.
  - b. Define terms and procedures associated with the slaughter of swine.
  - c. Define terms and procedures associated with the slaughter of lamb and goat.
  - d. Define terms and procedures associated with the slaughter of poultry.
  - e. Define terms and procedures associated with the slaughter of fish.
  - f. Define terms and procedures associated with dressing of wild game.
  - g. Discuss the difference between antemortem and postmortem inspection.
2. Discuss types, cleaning, use, and maintenance of slaughter facility and equipment. <sup>DOK1</sup>
  - a. Identify equipment, including immobilizer, skinning knives, rails and rail hooks, scales, dehairing machine, hoist, and carcass split saw.
  - b. Discuss maintenance of a safe and sanitary facility.
  - c. Identify what constitutes contamination from biologic and toxic sources.
3. Discuss procedures for slaughtering livestock and dressing wild game. <sup>DOK2</sup>
  - a. Discuss procedures for slaughtering beef.
  - b. Discuss procedures for slaughtering swine.
  - c. Discuss procedures for slaughtering lamb and goat.
  - d. Discuss procedures for dressing wild game.
  - e. Discuss procedures for slaughtering livestock and recognize when to condemn part of a carcass.
  - f. Describe methods of disposing of offal.

### Enrichment

#### Byproducts Scenario

As a new owner of a beef slaughterhouse, you need to find out what you can sell of animal byproducts. You need to research what byproducts you can sell and the price of those byproducts. Use the presentation rubric from the teacher resource document for guidance.

## Unit 5: Pricing, Wrapping, and Marketing

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<b>Competencies and Suggested Objectives</b>	
1.	Compare and contrast consumer trends, supply and demand, and the effects on meat prices. <sup>DOK1</sup> a. Discuss supply and demand and its effects on meat prices. b. Identify current consumer trends.
2.	List the steps and perform a cutting test. <sup>DOK2</sup> a. List the steps in a cutting test. b. Perform a cutting test.
3.	Discuss techniques and wrap retail meat. <sup>DOK2</sup> a. Discuss techniques of wrapping retail meats. b. Wrap and label meat for home freezing. c. Wrap, weigh, label, and price meat for retail sale. d. Describe the proper temperatures for maximum storage life of retail meats using a cooler, display case, or freezer. e. Vacuum seal various cuts of meat.
4.	Describe marketing principles related to the display of meat. <sup>DOK2</sup> a. Describe marketing principles related to the display of meat. b. Describe the effects vacuum sealing has on the shelf life of meat.
<b>Enrichment</b>	
<u>Meat Marketing Scenario</u> You are working for a large grocery chain in the advertising department. The chain is planning a big sales event next month and they expect you to develop the marketing plan for the meat departments. Use the presentation or poster rubric from the teach resource document for guidance.	

## Unit 6: Special Topics in Food Products (Meats) I

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Investigate new and emerging technologies, practices, trends, and issues associated with food products (meats). <sup>DOK3</sup><ol style="list-style-type: none"><li>a. Prepare and present a report on a new and emerging technology associated with food products (meats).</li><li>b. Prepare and present a report on a current trend or issue associated with food products (meats).</li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Complete school-to-careers activities related to food products (meats). <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Participate in a school-to-careers activity (shadowing, mentoring, career fair, etc.) related to food products (meats).</li><li>b. Investigate educational opportunities related to food products (meats) at the postsecondary level.</li><li>c. Describe national standards and certification/licensing procedures related to food products (meats).</li><li>d. Describe the role of trade organizations, associations, and unions as related to food products (meats).</li></ol></li></ol>
<ol style="list-style-type: none"><li>3. Demonstrate related academic skills and workplace skills associated with food products (meats). <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Complete a cooperative project (paper, presentation, or demonstration) associated with an academic subject and food products (meats).</li><li>b. Practice human relations skills (team participation, client/customer service, leadership, negotiation, working with culturally diverse groups, etc.) related to food products (meats).</li><li>c. Research work ethics and employer expectations of employees in food products (meats).</li></ol></li></ol>
<ol style="list-style-type: none"><li>4. Investigate the concepts of quality assurance as related to food products (meats). <sup>DOK3</sup><ol style="list-style-type: none"><li>a. Describe quality concepts and methods for measuring quality related to food products (meats).</li><li>b. Apply quality concepts in the food products (meats) laboratory.</li></ol></li></ol>
<ol style="list-style-type: none"><li>5. Examine trends and changes related to food products (meats) and global economic factors. <sup>DOK1</sup><ol style="list-style-type: none"><li>a. Define and discuss the concept of global economics and competition.</li><li>b. Describe global economic factors and competition as related to food products (meats).</li><li>c. Identify regions and other countries which compete in food products (meats).</li></ol></li></ol>
<b>Enrichment</b>
<p><b>Beef Trends Scenario:</b> As a food science worker with a major livestock board, your job is to keep up with current trends affecting the beef industry. You will give a presentation to the group on current trends, technologies, and jobs available in today's market. Use the presentation rubric from the teacher resource document for guidance.</p>

## Unit 7: Identification and Fabrication of Carcass and Box Beef

---

### Competencies and Suggested Objectives

1. Identify and safely fabricate cuts of beef. <sup>DOK2</sup>
  - a. Identify carcass break cuts of beef.
  - b. Make retail cuts of round.
  - c. Make retail cuts of loin.
  - d. Make retail cuts of rib.
  - e. Make retail cuts of chuck.
  - f. Make retail cuts of foreshank.
  - g. Make retail cuts of brisket.
  - h. Make retail cuts of plate.
  - i. Make retail cuts of flank.
2. Identify and safely fabricate variety cuts of beef. <sup>DOK2</sup>
  - a. Make retail cuts of tongue.
  - b. Make retail cuts of heart.
  - c. Make retail cuts of liver.
  - d. Make retail cuts of kidney.
  - e. Make retail cuts of brain.

### Enrichment

Retail Cuts Poster (could be used with other units as well)

You are the market manager at the local grocery store. You have just hired a new meat cutter, but you need to know how much she knows about cutting meat. You will need to develop a poster of retail cuts of beef to ensure your new butcher knows these cuts. Use poster rubric in teacher resource guide document for guidance.

## Unit 8: Identification and Fabrication of Carcass and Box Pork

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<b>Competencies and Suggested Objectives</b>
1. Identify and safely fabricate cuts of pork. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Identify carcass break cuts of pork.</li><li>Make retail cuts of ham.</li><li>Make retail cuts of loin.</li><li>Make retail cuts of shoulder (Boston butt and picnic).</li><li>Make retail cuts of side.</li></ol>
2. Identify and safely fabricate retail variety cuts of pork. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Make retail cuts of tongue.</li><li>Make retail cuts of liver.</li><li>Make retail cuts of chitterlings.</li><li>Make retail cuts of stomach.</li><li>Make retail cuts of kidneys.</li><li>Make retail cuts of snouts.</li></ol>

## Unit 9: Identification and Fabrication of Carcass Lamb and Goat

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<b>Competencies and Suggested Objectives</b>
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- |  |
|--|
| <ol style="list-style-type: none"><li>1. Identify and safely fabricate cuts of lamb and goat. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify carcass break cuts of lamb and goat.</li><li>b. Identify retail cuts of leg.</li><li>c. Identify retail cuts of loin.</li><li>d. Identify retail cuts of rib.</li><li>e. Identify retail cuts of shoulder.</li><li>f. Identify retail cuts of foreshank and breast.</li></ol></li></ol> |
|--|

# Unit 10: Identification and Fabrication of Poultry and Fish

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<b>Competencies and Suggested Objectives</b>
1. Identify and safely fabricate cuts of poultry. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Identify carcass break cuts of poultry.</li><li>Make retail cuts of breast quarter.</li><li>Make retail cuts of leg quarter.</li><li>Make retail cuts of back quarter.</li></ol>
2. Identify variety cuts of poultry. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Identify retail cuts of heart.</li><li>Identify retail cuts of liver.</li><li>Identify retail cuts of gizzard.</li><li>Identify retail cuts of neck.</li></ol>
3. Identify retail cuts of fish. <sup>DOK2</sup>
<b>Enrichment</b>
<b><u>Fry Cook</u></b> You have been asked to demonstrate the correct way of cutting up a chicken for frying. Develop a presentation using visuals.

# Unit 11: Identification and Fabrication of Wild Game

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## **Competencies and Suggested Objectives**

1. Identify and safely fabricate cuts of wild game. <sup>DOK2</sup>
  - a. Make cuts of top round.
  - b. Make cuts of bottom round.
  - c. Make cuts of tip roast.
  - d. Make cuts of eye round.
  - e. Make cuts of loin eye.
  - f. Make cuts of ribs.
  - g. Debone front shoulders.
2. Prepare wild game specialty products. <sup>DOK2</sup>
  - a. Prepare various sausage products.
  - b. Prepare ground products.
  - c. Discuss preparation of jerky products.

## **Enrichment**

### Deer Processing

The local wildlife department is making health checks on the local deer herd. They want to take twenty deer out of the population and donate these deer to a local charity. They have asked your meats class to help process these deer. They want you to process as many different products as possible, for example: steaks, roast, and ground products. Please demonstrate how to prepare their deer for this project.



## Unit 12: Automated Processing of Meats

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<b>Competencies and Suggested Objectives</b>
1. Observe and discuss the automated processing of various types of meat. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Observe and discuss step-by-step procedures for the automated slaughtering and fabrication processing of beef, pork, lamb, poultry, and fish.</li><li>Observe and discuss step-by-step procedures for the automated canning process of beef, pork, lamb, poultry, and fish.</li></ol>
<b>Enrichment</b>
<b><u>Proper Processing Plan</u></b> <p>You are searching for ways to automate your custom processing plant. As you watch the presentation, keep a journal of how you could incorporate the various systems in your plant. To help, draw diagrams along with your writings. Use the journal rubric in the teacher resource document for guidance.</p>

## Unit 13: Quality and Yield Grading

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<b>Competencies and Suggested Objectives</b>
1. Explain quality and yield grades for beef and determine classifications of beef. <sup>DOK2</sup> a. Explain quality grades for beef. b. Explain yield grades of beef. c. Determine classification of beef. d. Estimate amount of kidney fat, pelvic fat, and age. e. Estimate amount of marbling in a ribeye.
2. Explain quality grades and determine classification of pork. <sup>DOK2</sup> a. Explain quality grades for pork. b. Determine classification of pork.
3. Explain quality and yield grades for lamb and determine classifications of sheep. <sup>DOK2</sup> a. Explain quality grades of lamb. b. Explain yield grades of lamb. c. Determine classification of sheep.
4. Explain grades in poultry. <sup>DOK2</sup> a. Explain grades of poultry. b. Discuss poultry classifications.
<b>Enrichment</b>
<u>Grade My Ribeye Please</u> You are the food buyer for a major restaurant chain. You are presented four different high-end ribeye steaks to select from for the business. You will evaluate each ribeye, determine the quality grade, and select the best ribeye for your order. Use the job sheet/performance rubric in the teacher resource document for guidance.

## Unit 14: Curing, Smoking, and Sausage Making

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### Competencies and Suggested Objectives

1. Explain and demonstrate meat curing and smoking processes. <sup>DOK2</sup>
  - a. Define curing, smoking, and sausage making terms.
  - b. Describe the functions of curing and smoking.
  - c. Describe meat curing ingredients and calculate correct amount of each.
  - d. Explain methods of meat curing.
  - e. Identify and use equipment for the smoking and curing process.
  - f. Describe the process of curing bacon in brine solution.
  - g. Describe the process of curing jowl in brine solution.
  - h. Pump shoulders.
  - i. Pump hams.
  - j. Pump loin.
  - k. Discuss the process of smoking a shoulder, ham, loins, bacon, and jowls.
2. Explain and demonstrate the process of sausage making. <sup>DOK2</sup>
  - a. Mix and grind sausage with cure and seasoning.
  - b. Read a salinometer.
  - c. Prepare a brine solution.
  - d. Stuff sausage in casing.
  - e. Smoke sausage in smoker.

### Enrichment

#### Simply Sausage

You are a well-known sausage maker. Your company is very profitable because of your knowledge and skills. You have decided to take your claim to fame a step farther by creating a “how-to” sausage recipe book. You will need to include safety, sanitation, curing, stuffing, and smoking procedures.

## Unit 15: Special Topics in Food Products (Meats) II

<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Investigate new and emerging technologies, practices, trends, and issues associated with food products (meats). <sup>DOK3</sup><ol style="list-style-type: none"><li>a. Prepare a report on a new and emerging technology associated with food products (meats).</li><li>b. Prepare a report on a current trend or issue associated with food products (meats).</li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Complete school-to-careers activities related to food products (meats). <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Participate in a school-to-careers activity (shadowing, mentoring, career fair, etc.) related to food products (meats).</li><li>b. Investigate educational opportunities related to food products (meats) at the postsecondary level.</li><li>c. Describe national standards and certification/licensing procedures related to food products (meats).</li><li>d. Describe the role of trade organizations, associations, and unions as related to food products (meats).</li></ol></li></ol>
<ol style="list-style-type: none"><li>3. Demonstrate related academic skills and workplace skills associated with food products (meats). <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Complete a cooperative project (paper, presentation, or demonstration) associated with an academic subject and food products (meats).</li><li>b. Practice human relations skills (team participation, client/customer service, leadership, negotiation, working with culturally diverse groups, etc.) related to food products (meats).</li><li>c. Research work ethics and employer expectations of employees in food products (meats).</li></ol></li></ol>
<ol style="list-style-type: none"><li>4. Investigate the concepts of quality assurance as related to food products (meats). <sup>DOK3</sup><ol style="list-style-type: none"><li>a. Describe concepts and methods for measuring quality related to food products (meats).</li><li>b. Apply quality concepts in the food products (meats) laboratory.</li></ol></li></ol>
<ol style="list-style-type: none"><li>5. Examine trends and changes related to food products (meats) and global economic factors. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Define and discuss the concept of global economics and competition.</li><li>b. Describe global economic factors and competition as related to food products (meats).</li><li>c. Identify regions and other countries which compete in food products (meats).</li></ol></li></ol>
<b>Enrichment</b>
<u>Trending Now</u> <p>As a food science worker with a major livestock board, your job is to keep up with current trends affecting the meat industry. You will give a presentation to this board (your peers) on current trends, technologies, and jobs available in today's market. Use the presentation rubric from the teacher resource document for guidance.</p>

# 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: Careers and Leadership</b>		
	1.	Identify career opportunities in meat cutting, packing, and processing professions.
	2.	Identify the leadership opportunities and activities which are beneficial to students in meat cutting, packing, and processing.
<b>Unit 2: Orientation to Meat Processing</b>		
	1.	Explain trends in slaughtering and processing in the past and in the future.
	2.	Describe factors affecting consumer food spending.
<b>Unit 3: Safety, Sanitation, Equipment, and Facility Maintenance</b>		
	1.	Explain general meat laboratory safety requirements.
	2.	Discuss sanitation as it applies to a meat cutting facility.
	3.	Discuss federal regulations related to meat processing.
	4.	Identify and safely use equipment for meat cutting, packing, and processing.
	5.	Demonstrate equipment maintenance used in a meat cutting facility.
	6.	Maintain a safe and sanitary facility.
<b>Unit 4: Custom Livestock Slaughter</b>		
	1.	Explain terms and procedures associated with livestock slaughter.
	2.	Discuss types, cleaning, use, and maintenance of slaughter facility and equipment.
	3.	Discuss procedures for slaughtering livestock and dressing wild game.

<b>Unit 5: Pricing, Wrapping, and Marketing</b>		
	1.	Compare and contrast consumer trends, supply and demand, and the effects on meat prices
	2.	List the steps and perform a cutting test.
	3.	Discuss techniques and wrap retail meat.
	4.	Describe marketing principles related to the display of meat.
<b>Unit 6: Special Topics in Food Products (Meats) I</b>		
	1.	Investigate new and emerging technologies, practices, trends, and issues associated with food products (meats).
	2.	Complete school-to-careers activities related to food products (meats).
	3.	Demonstrate related academic skills and workplace skills associated with food products (meats).
	4.	Investigate the concepts of quality assurance as related to food products (meats).
	5.	Examine trends and changes related to food products (meats) and global economic factors.
<b>Unit 7: Identification and Fabrication of Carcass and Box Beef</b>		
	1.	Identify and safely fabricate cuts of beef.
	2.	Identify and safely fabricate variety cuts of beef.
<b>Unit 8: Identification and Fabrication of Carcass and Box Pork</b>		
	1.	Identify and safely fabricate cuts of pork.
	2.	Identify and safely fabricate retail variety cuts of pork.
<b>Unit 9: Identification and Fabrication of Carcass Lamb and Goat</b>		
	1.	Identify and safely fabricate cuts of lamb and goat.
<b>Unit 10: Identification and Fabrication of Poultry and Fish</b>		
	1.	Identify and safely fabricate cuts of poultry.
	2.	Identify variety cuts of poultry.
	3.	Identify retail cuts of fish.
<b>Unit 11: Identification and Fabrication of Wild Game</b>		
	1.	Identify and safely fabricate cuts of wild game.
	2.	Prepare wild game specialty products.

<b>Unit 12: Automated Processing of Meats</b>		
	1.	Observe and discuss the automated processing of various types of meat.
<b>Unit 13: Quality and Yield Grading</b>		
	1.	Explain quality and yield grades for beef and determine classifications of beef.
	2.	Explain quality grades and determine classification of pork.
	3.	Explain quality and yield grades for lamb and determine classifications of sheep.
	4.	Explain grades in poultry.
<b>Unit 14: Curing, Smoking, and Sausage Making</b>		
	1.	Explain and demonstrate meat curing and smoking processes.
	2.	Explain and demonstrate the process of sausage making.
<b>Unit 15: Special Topics in Food Products (Meats) II</b>		
	1.	Investigate new and emerging technologies, practices, trends, and issues associated with food products (meats).
	2.	Complete school-to-careers activities related to food products (meats).
	3.	Demonstrate related academic skills and workplace skills associated with food products (meats).
	4.	Investigate the concepts of quality assurance as related to food products (meats).
	5.	Examine trends and changes related to food products (meats) and global economic factors.

# Appendix A: Industry Standards

## AGRICULTURE, FOOD, AND NATURAL RESOURCES (AFNR) PATHWAY CONTENT STANDARDS AND PERFORMANCE ELEMENTS

Crosswalk for Food Products (Meats)											
	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
AFNR											
AF -FOOD PRODUCTS AND PROCESSING SYSTEMS		X	X	X	X	X	X	X	X	X	X
AFNR											
		Unit 11	Unit 12	Unit 13	Unit 14	Unit 15					
		X	X	X	X	X					

### AF - FOOD PRODUCTS AND PROCESSING SYSTEMS

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 Street, 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/)

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles, practices, and techniques in the processing, storage, and development of food products.

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

FPP.01.01 Analyze and manage operational and safety procedures in food products and processing facilities.

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

FPP.01.03 Apply food safety procedures when storing food products to ensure food quality.

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

FPP.02.01 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 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 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 Select and process food products for storage, distribution, and consumption.**

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

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

FPP.03.03 Create food distribution plans and procedures to ensure safe delivery of food products.

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

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

FPP.04.02 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 Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.





## 2021 Heating, Ventilation, and Air Conditioning (HVAC)

Program CIP: 47.0201— Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician

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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 HVAC curriculum is aligned to the following standards:

## **National Center for Construction Education and Research (NCCER) Learning Series**

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

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## **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 Ready 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

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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 HVAC pathway is an instructional program that prepares students for employment or continued education in the occupations of heating, ventilation, and air-conditioning. The curriculum framework for this program was developed in partnership with the Mississippi Construction Education Foundation (MCEF). MCEF is the accredited sponsor for the National Center for Construction Education and Research (NCCER).

## **Grade Level and Class Size Recommendations**

It is recommended that students enter this program as a 10th grader. 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 CTE 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 HVAC—Course Code: 993018**
2. **Applications of HVAC—Course Code: 993019**
3. **Theory of HVAC—Course Code: 993022**
4. **Advanced HVAC—Course Code: 993023**

### **Course Description: Fundamentals of HVAC**

This course includes an introduction to the field as well as fundamentals of safety, math, and hand and power tools.

### **Course Description: Applications of HVAC**

This course provides an introduction to blueprints, materials handling, introduction to HVAC, copper and plastic piping, soldering and brazing, basic electricity, and trade math. It gives students real-world, hands-on practice in these areas. This course should only be taken after students successfully complete Fundamentals of HVAC.

### **Course Description: Theory of HVAC**

This course includes an in-depth study of the heating, ventilation, and air-conditioning profession, carbon steel piping practice, introduction to cooling, and introduction to heating. The course also reinforces safety related to the installation and service of HVAC applications. This course should only be taken after students successfully complete Applications of HVAC.

### **Course Description: Advanced HVAC**

This course includes an in-depth study of the heating, ventilation, and air conditioning profession, air distribution systems, leak detection evacuation recovery and charging, alternating current, and basic electronics. The course also reinforces safety related to the installation and service of HVAC applications. It should only be taken after students successfully complete Theory of HVAC. Scheduling and operating more than one course in the same classroom/laboratory with the same instructor is not allowed. Safety is reinforced and tested at the beginning of each course.

**Fundamentals of HVAC—Course Code: 993018**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Introduction and Orientation	3
2	Employability Skills	7.5
3	Fundamentals of Student Organizations	4.5
4	Communication Skills	7.5
5	Basic Safety	35
6	Introduction to Construction Math	25
7	Hand Tools	15
8	Power Tools	15
9	Introduction to Construction Drawings	20
<b>Total</b>		<b>132.5</b>

**Applications of HVAC—Course Code: 993019**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
10	Introduction to Materials Handling	20
11	Introduction to HVAC	10
12	Copper and Plastic Piping	15
13	Soldering and Brazing	15
14	Basic Electricity (HVAC)	30
<b>Total</b>		<b>90</b>

**Theory of HVAC—Course Code: 993022**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
15	Orientation and Safety	17
16	Trade Math	24
17	Basic Carbon Steel Piping Practice	34
18	Introduction to Cooling	50
<b>Total</b>		<b>125</b>

**Advanced HVAC—Course Code: 993023**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
19	Introduction to Heating	40
20	Air Distribution Systems	35
21	Leak Detection Evacuation Recovery and Charging	30
22	Alternating Current	30
<b>Total</b>		<b>135</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. HVAC I—Course Code: 993020
2. HVAC II—Course Code: 993021

### Course Description: HVAC I

This course emphasizes heating, ventilation, and air-conditioning. Topics include employability skills, safety, construction math, construction drawings, materials handling, copper and piping, soldering and brazing, and basic electricity.

### Course Description: HVAC II

This course emphasizes heating, ventilation, and air-conditioning. Topics include employability skills, safety, carbon steel piping, introduction to cooling, introduction to heating, air distribution, leak detection evacuation recovery and charging, alternating current, and basic electronics. This course should be taken after the student has successfully completed HVAC I. Scheduling and operating more than one course in the same classroom/laboratory with the same instructor is not allowed. Safety is reinforced and tested at the beginning of each course.

### HVAC I—Course Code: 993020

Unit	Title	Hours
1	Orientation	3
2	Employability Skills	7.5
3	Fundamentals of Student Organizations	4.5
4	Communication Skills	7.5
5	Basic Safety	35
6	Introduction to Construction Math	25
7	Hand Tools	15
8	Power Tools	15
9	Introduction to Construction Drawings	20
10	Introduction to Materials Handling	20
11	Introduction to HVAC	10
12	Basic Copper and Plastic Piping	15
13	Soldering and Brazing	15
14	Basic Electricity (HVAC)	30
<b>Total</b>		222.5

**HVAC II—Course Code: 993021**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
15	Orientation and Safety	17
16	Trade Math	24
17	Basic Carbon Steel Piping Practice	34
18	Introduction to Cooling	50
20	Introduction to Heating	40
21	Air Distribution Systems	35
22	Leak Detection, Evacuation Recovery, and Charging	30
23	Alternating Current	30
<b>Total</b>		<b>260</b>

# Career Pathway Outlook

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## Overview

Employment of HVAC mechanics and installers is projected to grow 13% by 2028 in the U.S. and 10% in Mississippi—much faster than the average for all occupations. HVAC systems can be found in most buildings; therefore, employment opportunities are readily available for qualified HVAC technicians. Because of the increasing development and complexity of HVAC technology, success in this field requires continuous education to stay current with the latest equipment and skills. In addition to technical skills, having good listening, speaking, time management, and critical thinking skills can also contribute to success in this occupation. In the secondary HVAC program, students can earn NCCER HVAC Level 1 certification, which will give students a head start on obtaining industry-recognized credentials and better prepare them for a postsecondary HVAC program.

## Needs of the Future Workforce

Data for this synopsis were compiled from employment projections prepared by the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (2019), and the Mississippi Department of Employment Security (2019).

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2019
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	2,130	2,340	210	9.9%	\$19.66
Helpers—Installation, Maintenance, and Repair Workers	1,400	1,510	110	7.9%	\$15.80
Installation, Maintenance, and Repair Workers, All Other	730	760	30	4.1%	\$20.88

Source: Mississippi Department of Employment Security; [mdes.ms.gov](http://mdes.ms.gov) (2019).

## Perkins V Requirements and Academic Infusion

The HVAC curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in HVAC fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for HVAC careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, the curriculum 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 HVAC 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—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 can foster the types of learning expected from the HVAC curriculum. SkillsUSA is an example of a student organization with many outlets for HVAC. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of HVAC 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 HVAC 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 HVAC curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the HVAC curriculum that allow and encourage collaboration with professionals currently in the HVAC field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the HVAC 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 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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## **Suggested Time on Task**

This section indicates an estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80% of the time in the course. The remaining percentage of class time will include instruction in non-tested material, review for end-of-course testing, and special projects.

## **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 resources 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 to 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 HVAC 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 HVAC 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>
<ol style="list-style-type: none"><li>1. Describe local program and center expectations, policies, and procedures. <sup>DOK 1</sup><ol style="list-style-type: none"><li>a. Describe local program and career center policies and procedures, including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.</li><li>b. Give a brief overview of the course. Explain to students what HVAC is, why it is important, and how it will be delivered.</li><li>c. Compare and contrast local program and school policies to the expectations of employers.</li><li>d. Preview course objectives, program policy, and industry standards.</li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Discuss work-based learning (WBL) opportunities related to program areas. <sup>DOK 1</sup><ol style="list-style-type: none"><li>a. Define WBL.</li><li>b. Explore the opportunities available through the program areas below.<ul style="list-style-type: none"><li>• CPE</li><li>• Job shadowing</li><li>• Apprenticeship programs</li><li>• On-the-job training</li><li>• Other opportunities.</li></ul></li></ol></li></ol>

## Unit 2: Employability Skills

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<b>Competencies and Suggested Objectives</b>	
1. Describe employment opportunities in the construction industry. <sup>DOK 1</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>DOK 1</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>DOK 1</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>DOK 1</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>DOK 1</sup> <ol style="list-style-type: none"><li>Trace the history of the program area's student organization.</li><li>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>DOK 1</sup> <ol style="list-style-type: none"><li>Discuss the membership process for the program area's student organization.</li><li>Explain the activities related to the local chapter and the state and national organizations.</li></ol>
3. Discuss the organization's brand resources. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Identify the motto, creed, and/or pledge and discuss their meanings.</li><li>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>DOK 1</sup> <ol style="list-style-type: none"><li>Demonstrate verbal and nonverbal communication skills.</li><li>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>DOK 2</sup> <ol style="list-style-type: none"><li>Define leadership.</li><li>Discuss the attributes of a leader.</li><li>Identify the roles a leader can assume.</li></ol>
6. Utilize team-building skills in class- and work-related situations. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Define team-building.</li><li>Discuss the attributes of a team.</li><li>Identify the roles included in a team.</li></ol>
7. Discuss the various competitions offered through the program area's student organization. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Describe each of the competitions and the skills needed to accomplish the tasks.</li><li>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>DOK 2</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>DOK 2</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>DOK 2</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>DOK 1</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>DOK 1</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>DOK 1</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>DOK 1</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>DOK 1</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>DOK 1</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>DOK 1</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>
<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.



## Unit 6: Introduction to Construction Math

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Apply the four basic math skills using whole numbers, fractions, decimals, and percentages, both with and without a calculator. <sup>DOK 2</sup><ol style="list-style-type: none"><li>a. Define basic geometric shapes used in the construction industry.</li><li>b. Add, subtract, multiply, and divide whole numbers, decimals, and fractions with and without a calculator.</li><li>c. Convert whole numbers to fractions and convert fractions to whole numbers.</li><li>d. Convert decimals to percentages and convert percentages to decimals.</li><li>e. Convert fractions to decimals.</li><li>f. Convert fractions to percentages.</li><li>g. Demonstrate reading a standard and metric ruler and a tape measure.</li><li>h. Recognize and use metric units of length, weight, volume, and temperature.</li></ol></li></ol>

## 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>DOK 2</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>DOK 2</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>DOK 3</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>
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| <ol style="list-style-type: none"><li>1. Safely handle and store materials. <sup>DOK 1</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> |
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# Unit 11: Introduction to HVAC

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Identify and explain heating, ventilation, air-conditioning, and refrigeration (HVAC/R) systems, HVAC/R environmental law, and job opportunities that are available in the HVAC/R profession. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Explain the basic principles of HVAC/R.</li><li>b. Describe the principles that guide HVAC/R installation and service techniques.</li></ol></li></ol> |
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## Unit 12: Basic Copper and Plastic Piping

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify and discuss the tools used in the piping trade, discuss the materials and methods used in connecting piping systems, and perform copper and plastic piping tasks found in the industrial maintenance and HVAC environment. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Discuss and demonstrate how to use copper tubing in HVAC.</li><li>b. Discuss and demonstrate how to use plastic tubing in HVAC.</li></ol></li></ol>

## Unit 13: Soldering and Brazing

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<b>Competencies and Suggested Objectives</b>
1. Identify and utilize PPE, tools, and materials required to solder and braze copper tubing. <sup>DOK1</sup>
2. Prepare and solder/braze copper tubing systems in various industrial and HVAC applications and properly clean and install fittings. <sup>DOK2</sup>



## Unit 14: Basic Electricity (HVAC)

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify electrical safety hazards, demonstrate safety around circuits and equipment, describe basic electricity laws, interpret electrical drawings and schematics, and demonstrate wiring basic electrical circuits. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Describe how voltage, current, resistance, and power are mathematically related.</li><li>b. Describe the difference between series and parallel circuits and calculate loads in each.</li><li>c. Describe the purpose and operation of the various electrical components used in equipment.</li></ol></li></ol>

## Unit 15: Orientation and Safety

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<b>Competencies and Suggested Objectives</b>	
1.	Describe local program and vocational/career technical center policies and procedures. DOK2
2.	Describe employment opportunities and responsibilities of the industrial and HVAC mechanic. <sup>DOK2</sup> a. Describe employer expectations in the workplace.
3.	Explore leadership skills and personal development opportunities provided for students by student organizations, including SkillsUSA. <sup>DOK2</sup> a. Demonstrate effective team-building and leadership skills. b. Practice appropriate work ethics.
4.	Describe general safety rules for working in a shop/lab and industry. <sup>DOK2</sup> a. Discuss safety issues and prevention associated with the HVAC shop area. b. Explain fire safety and prevention in the workplace.

## Unit 16: Trade Math

---

<b>Competencies and Suggested Objectives</b>
--

- |   |
|---|
| <ol style="list-style-type: none"><li>1. Identify proper math to use for problem-solving; use English and metric measurement; use powers, algebra, and geometric calculation to solve for HVAC problems; and convert Fahrenheit to Celsius. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Demonstrate how to calculate mathematic problems found in the HVAC trade.</li></ol></li></ol> |
|---|

## Unit 17: Basic Carbon Steel Piping Practice

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<b>Competencies and Suggested Objectives</b>
--

- |  |
|--|
| <ol style="list-style-type: none"><li>1. Recognize the types and sizes of carbon steel piping and pipe fittings, and demonstrate the tools used to cut, ream, and thread carbon steel pipe in the HVAC trade. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Explain the uses of carbon steel pipes in the HVAC trade.</li><li>b. Assemble and install carbon steel pipes and fittings.</li></ol></li></ol> |
|--|

## Unit 18: Introduction to Cooling

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Explain the basic cooling systems, heat transfer, trade terms, refrigerants, components, controls, and proper piping of the cooling system. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Explain how an HVAC system removes heat from the air-conditioned area of an HVAC system.</li><li>b. Identify the major components, accessories, refrigerants, and control devices available for cooling systems, and explain how each works.</li><li>c. Discuss Environmental Protection Agency (EPA) standards.</li></ol></li></ol>

## Unit 19: Introduction to Heating

---

<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Explain methods of heat transfer and characteristics of combustion; identify types of fuels and furnaces and components of electric, hydronic, and gas furnaces; identify and safely use meters in gas measurement; and perform maintenance on electric and gas furnaces.<sup>DOK2</sup><ol style="list-style-type: none"><li>a. Explain how a heating system operates.</li><li>b. Perform basic furnace preventive maintenance procedures, such as cleaning and filter replacement, with supervision.</li></ol></li></ol>

## Unit 20: Air Distribution Systems

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<b>Competencies and Suggested Objectives</b>
1. Demonstrate the design and installation of HVAC duct systems. <sup>DOK2, ADS</sup> <ol style="list-style-type: none"><li>Discuss the patterns of airflow and pressures in an HVAC duct.</li><li>Identify types of duct systems and explain where each is used in HVAC applications.</li><li>Describe the mechanical equipment and materials used to create air distribution systems.</li></ol>
2. Discuss the installation of ductwork. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Identify, select, and use fasteners.</li><li>Discuss connecting rectangular, round, and spiral ductwork.</li><li>Explain how to properly seal ductwork.</li></ol>

## Unit 21: Leak Detection, Evacuation, Recovery, and Charging

---

<b>Competencies and Suggested Objectives</b>
1. Identify leaks in an HVAC system and perform the proper steps to repair the leak, restoring the unit to operation. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Describe what the Clean Air Act means to the HVAC trade.</li><li>Define and perform a leak test on an HVAC system.</li><li>Use nitrogen to purge a system, and charge refrigerant into a system by the methods below.<ul style="list-style-type: none"><li>Weight</li><li>Superheat</li><li>Subcooling</li><li>Charging pressure</li></ul></li></ol>
2. Identify/install a basic vacuum pump service operation. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Describe the safety procedures for using a vacuum pump.</li><li>Install and use a vacuum pump on a system.</li></ol>
3. Explain the procedures for evacuation and recovery. <sup>DOK 1</sup>



## Unit 22: Alternating Current

---

<b>Competencies and Suggested Objectives</b>
1. Explain how single- and three-phase AC power is generated and transmitted for use. <sup>DOK1</sup>
2. Examine the safe operation of electrical transformers, motors, and single- and three-phase HVAC devices. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Explain and demonstrate the safe operation of various types of transformers.</li><li>Describe the types of capacitors and motors found in the HVAC unit.</li><li>State and demonstrate the safety precautions that must be followed when working with electrical equipment and testing AC components, including capacitors, transformers, and motors.</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: Orientation</b>		
	1.	Describe local program and center expectations, policies, and procedures.
	2.	Discuss work-based learning (WBL) opportunities related to program areas.
<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: Introduction to HVAC</b>		
	1.	Identify and explain heating, ventilation, air-conditioning, and refrigeration (HVAC/R) systems, HVAC/R environmental law, and job opportunities that are available in the HVAC/R profession.
<b>Unit 12: Basic Copper and Plastic Piping</b>		
	1.	Identify and discuss the tools used in the piping trade, discuss the materials and methods used in connecting piping systems, and perform copper and plastic piping tasks found in the industrial maintenance and HVAC environment.
<b>Unit 13: Soldering and Brazing</b>		
	1.	Identify and utilize PPE, tools, and materials required to solder and braze copper tubing.
	2.	Prepare and solder/braze copper tubing systems in various industrial and HVAC applications and properly clean and install fittings.
<b>Unit 14: Basic Electricity (HVAC)</b>		
	1.	Identify electrical safety hazards, demonstrate safety around circuits and equipment, describe basic electricity laws, interpret electrical drawings and schematics, and demonstrate wiring basic electrical circuits.
<b>Unit 15: Orientation and Safety</b>		
	1.	Describe local program and vocational/career technical center policies and procedures.
	2.	Describe employment opportunities and responsibilities of the industrial and HVAC mechanic.

	3.	Explore leadership skills and personal development opportunities provided for students by student organizations, including SkillsUSA.
	4.	Describe general safety rules for working in a shop/lab and industry.
<b>Unit 16: Trade Math</b>		
	1.	Identify proper math to use for problem solving; use English and metric measurement; use powers, algebra, and geometric calculation to solve for HVAC problems; and convert Fahrenheit to Celsius.
<b>Unit 17: Basic Carbon Steel Piping Practice</b>		
	1.	Recognize the types and sizes of carbon steel piping and pipe fittings, and demonstrate the tools used to cut, ream, and thread carbon steel pipe in the HVAC trade.
<b>Unit 18: Introduction to Cooling</b>		
	1.	Explain the basic cooling systems, heat transfer, trade terms, refrigerants, components, controls, and proper piping of the cooling system.
<b>Unit 19: Introduction to Heating</b>		
	1.	Explain methods of heat transfer and characteristics of combustion; identify types of fuels and furnaces and components of electric, hydronic, and gas furnaces; identify and safely use meters in gas measurement; and perform maintenance on electric and gas furnaces.
<b>Unit 20: Air Distribution Systems</b>		
	1.	Demonstrate the design and installation of HVAC duct systems.
	2.	Discuss the installation of ductwork.
<b>Unit 21: Leak Detection, Evacuation, Recovery, and Charging</b>		
	1.	Identify leaks in an HVAC system and perform the proper steps to repair the leak, restoring the unit to operation.
	2.	Identify/install a basic vacuum pump service operation.
	3.	Explain the procedures for evacuation and recovery.
<b>Unit 22: Alternating Current</b>		
	1.	Explain how single- and three-phase AC power is generated and transmitted for use.
	2.	Examine the safe operation of electrical transformers, motors, and single- and three-phase HVAC devices.

# Appendix A: Industry Standards

## HVAC PATHWAY

### CONTENT STANDARDS AND PERFORMANCE ELEMENTS<sup>1</sup>

Crosswalk for HVAC											
	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
<b>CORE</b>											
<b>BSM</b>						X					
<b>ICM</b>							X				
<b>IHT</b>								X			
<b>IPT</b>									X		
<b>BLU</b>										X	
<b>COM</b>					X						
<b>EMP</b>			X								
<b>IMH</b>											X
<b>LEVEL 1- HVAC</b>											
		Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18	Unit 19	Unit 20
<b>INT</b>		X									
<b>CPP</b>			X								
<b>SBR</b>				X							
<b>BEL</b>					X						
<b>TMA</b>							X				
<b>BAS</b>						X					
<b>EMP</b>						X					
<b>BCP</b>								X			
<b>ITC</b>									X		
<b>ITH</b>										X	
<b>ADS</b>											X

	Units	Unit 21	Unit 22								
<b>HVAC Level 2</b>											
<b>LDE</b>		X									
<b>ALT</b>			X								

<sup>1</sup> NCCER learning series. Retrieved October 31, 2019, from <http://www.nccer.org/>

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)

NCCER HVAC

LEVEL ONE

Level One

INT – Introduction to HVAC (03101-V5)

TMA – Trade Mathematics (03102- V5)

CPP – Basic Copper and Plastic Piping Practices (03103- V5)

SBR – Soldering and Brazing (03104- V5)

BCP – Basic Carbon Steel Piping Practices (03105- V5)

BEL – Basic Electricity (03106- V5)

ITC – Introduction to Cooling (03107- V5)

ITH – Introduction to Heating (03108- V5)

ADS – Air Distribution Systems (03109- V5)

Level 2

LDE – Leak Detection, Evacuation, Recovery, and Charging (03205- V5)

ALT – Alternating Current (03206- V5)





## 2021 Industrial Maintenance

Program CIP: 47.0303 – Industrial Mechanics and Maintenance Technology

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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 industrial maintenance curriculum is aligned to the following standards:

## **National Center for Construction Education and Research (NCCER) Learning Series**

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[nccer.org/index.asp](http://nccer.org/index.asp)

## **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 Ready 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**

Industrial maintenance is an instructional program that prepares students for employment or continued education in the occupations of installation, maintenance, and repair work. The curriculum framework for this program was developed in partnership with the Mississippi Construction Education Foundation (MCEF). MCEF is the accredited sponsor for the NCCER.

## **Grade Level and Class Size Recommendations**

It is recommended that students enter this program as a 10th grader. 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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## **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 Industrial Maintenance—Course Code: 993002**
- 2. Application of Industrial Maintenance—Course Code: 993003**
- 3. Theory of Industrial Maintenance—Course Code: 993012**
- 4. Advanced Skills of Industrial Maintenance—Course Code: 993013**

### **Course Description: Fundamentals of Industrial Maintenance**

This course includes an introduction to the field as well as fundamentals of safety, math, and hand and power tools.

### **Course Description: Application of Industrial Maintenance**

This course provides an introduction to blueprints, materials handling, orientation to the trade, tools of the trade, fasteners and anchors, oxy-fuel cutting, and craft-related mathematics. This course gives students real-world, hands-on practice in these areas.

### **Course Description: Theory of Industrial Maintenance**

This course includes an in-depth study of the industrial maintenance profession, test equipment, gaskets and packing, pumps and pump drivers, types of valves, and machine lubrication. This course also reinforces safety related to the industrial maintenance industry.

### **Course Description: Advanced Skills of Industrial Maintenance**

This course includes an in-depth study of material handling and rigging, mobile and support equipment, electrical theory, conductor terminations and splices, and hydraulic and pneumatic systems.

**Fundamentals of Industrial Maintenance—Course Code: 993002**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
1	Orientation	3
2	Employability Skills	7.5
3	Fundamentals of Student Organizations	4.5
4	Communication Skills	7.5
5	Basic Safety	35
6	Introduction to Construction Math	15
7	Hand Tools	22.5
8	Power Tools	22.5
<b>Total</b>		<b>117.5</b>

**Application of Industrial Maintenance—Course Code: 993003**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
9	Introduction to Construction Drawings	15
10	Introduction to Materials Handling	7.5
11	Tools of the Trade	15
12	Fasteners and Anchors	15
13	Oxy-Fuel Cutting	22.5
14	Basic Electrical (Industrial Maintenance)	15
15	Soldering and Brazing Copper and Plastic Piping	22.5
<b>Total</b>		<b>112.5</b>

**Theory of Industrial Maintenance—Course Code: 993012**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
16	Safety Review and Orientation to the Trade	22.5
17	Craft – related Mathematics	15
18	Gaskets and Packing	22.5
19	Pumps and Drivers	15
20	Introduction to Valves	15
21	Lubrication	15
22	Construction Drawings	15
23	Test Equipment	15
<b>Total</b>		<b>135</b>

**Advanced Skills of Industrial Maintenance—Course Code: 993013**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
24	Material Handling and Rigging	20
25	Mobile and Support Equipment	15
26	Hydraulic Systems	15
27	Pneumatic Systems	15
28	Electrical Theory and Conductor Terminations and Splices	25
29	SMAW-Groove Welds with Backing	47.5
<b>Total</b>		<b>137.5</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. **Industrial Maintenance I—Course Code: 993001**
2. **Industrial Maintenance II—Course Code: 993011**

### Course Description: Industrial Maintenance I

This course introduces students to fundamentals of safety, tools, math, blueprint reading, materials handling, fasteners and anchors, and oxy-fuel cutting.

### Course Description: Industrial Maintenance II

This course is a continuation of Industrial Maintenance I, with the emphasis on employability skills, safety, gaskets, packing, pumps, drivers, valves, lubrication, construction drawings, test equipment, material handling and rigging, mobile and support equipment, electrical theory, conductor termination and splices, hydraulic and pneumatic systems, and welding.

### Industrial Maintenance I—Course Code: 993001

Unit	Title	Hours
1	Orientation	3
2	Employability Skills	7.5
3	Fundamentals of Student Organizations	4.5
4	Communication Skills	7.5
5	Basic Safety	35
6	Introduction to Construction Math	15
7	Hand Tools	22.5
8	Power Tools	22.5
9	Introduction to Construction Drawings	15
10	Introduction to Materials Handling	7.5
11	Tools of the Trade	15
12	Fasteners and Anchors	15
13	Oxy-Fuel Cutting	22.5
14	Basic Electrical (Industrial Maintenance)	15
15	Soldering and Brazing Copper and Plastic Piping	22.5
<b>Total</b>		<b>230</b>

**Industrial Maintenance II—Course Code: 993011**

<b>Unit</b>	<b>Title</b>	<b>Hours</b>
16	Safety Review and Orientation to the Trade	22.5
17	Craft – related Mathematics	15
18	Gaskets and Packing	22.5
19	Pumps and Drivers	15
20	Introduction to Valves	15
21	Lubrication	15
22	Construction Drawings	15
23	Test Equipment	15
24	Material Handling and Rigging	20
25	Mobile and Support Equipment	15
26	Hydraulic Systems	15
27	Pneumatic Systems	15
28	Electrical Theory and Conductor Terminations and Splices	25
29	SMAW-Groove Welds with Backing	47.5
<b>Total</b>		<b>272.5</b>

# Career Pathway Outlook

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## Overview

Industrial machinery mechanics and machinery maintenance workers install, maintain, and repair manufacturing equipment and other industrial machineries such as conveying systems, production machinery, and packaging equipment. Millwrights install, dismantle, repair, reassemble, and move machinery in factories, power plants, and construction sites. Workers in this occupation must follow safety precautions and use protective equipment such as hardhats, safety glasses, and hearing protectors. Most work full time in manufacturing facilities; however, they may be on call and work night or weekend shifts. Overtime is common.

Industrial machinery mechanics, machinery maintenance workers, and millwrights typically need a high school diploma. Industrial machinery mechanics and machinery maintenance workers also usually need at least a year of on-the-job training. Most millwrights go through an apprenticeship program that may last up to four years.

## Needs of the Future Workforce

In Mississippi, employment of industrial machinery mechanics, machinery maintenance workers, and millwrights is projected to grow faster than average for all occupations. The need to keep increasingly sophisticated machinery functioning and efficient will continue to create demand for these workers. Data for this synopsis were compiled from employment projections prepared by the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (2020), and the Mississippi Department of Employment Security (2020).

Table 1.1: Current and Projected Occupation Report

<b>Description</b>	<b>Jobs, 2016</b>	<b>Projected Jobs, 2026</b>	<b>Change (Number)</b>	<b>Change (Percent)</b>	<b>Average Hourly Earnings, 2019</b>
Industrial Machinery Mechanics	4,350	4,880	530	12.2	\$23.86
Maintenance Workers, Machinery	1,480	1,660	180	12.2	\$20.99
Millwrights	1,270	1,390	120	9.5	\$20.83
Installation, Maintenance, and Repair Workers—All Other	730	760	30	4.1	\$20.88
Helpers—Installation, Maintenance, and Repair Workers	1,400	1,510	110	7.9	\$15.80

Source: Mississippi Department of Employment Security; mdes.ms.gov (2019).

**Perkins V Requirements and Academic Infusion**

The industrial maintenance curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in industrial maintenance fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for industrial maintenance careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, the curriculum 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 industrial maintenance 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—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 industrial maintenance curriculum. SkillsUSA is an example of a student organization with many outlets for industrial maintenance. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of industrial maintenance 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 industrial maintenance 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 industrial maintenance curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the industrial maintenance curriculum that will allow and encourage collaboration with professionals currently in the field.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the industrial maintenance 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 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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## **Suggested Time on Task**

This section indicates an estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80% of the time in the course. The remaining percentage of class time will include instruction in non-tested material, review for end-of-course testing, and special projects.

## **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 industrial maintenance 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 industrial maintenance 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. Describe local program and center expectations, policies, and procedures. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Describe local program and career center policies and procedures, including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.</li><li>Give a brief overview of the course. Explain to students what industrial maintenance is, why it is important, and how it will be delivered.</li><li>Compare and contrast local program and school policies to the expectations of employers.</li><li>Preview course objectives, program policy, and industry standards.</li></ol>
2. Discuss work-based learning (WBL) opportunities related to program areas. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Define WBL.</li><li>Explore the opportunities available through program areas such as WBL, job shadowing, apprenticeship programs, on-the-job training, and so forth.</li></ol>

## Unit 2: Employability Skills

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<b>Competencies and Suggested Objectives</b>	
1. Describe employment opportunities in the construction industry. <sup>DOK 1</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>DOK 1</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>DOK 1</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>DOK 1</sup>	
a. Compare and contrast employment responsibilities and expectations to local school and program policies and expectations.	
b. Define effective relationship skills and identify 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 career and technical student organizations (CTSOs) for industrial maintenance, including SkillsUSA. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Trace the history of the CTSO for industrial maintenance.</li><li>Identify the mission, purpose, and/or goals of the CTSO for industrial maintenance.</li></ol>
2.	Explore the advantages of membership in a CTSO. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Discuss the membership process for the CTSO for industrial maintenance.</li><li>Explain the activities related to the local chapter and the state and national organizations.</li></ol>
3.	Discuss the organization's brand resources. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Identify the motto, creed, and/or pledge and discuss their meanings.</li><li>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>DOK 1</sup> <ol style="list-style-type: none"><li>Demonstrate verbal and nonverbal communication skills.</li><li>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>DOK 2</sup> <ol style="list-style-type: none"><li>Define leadership.</li><li>Discuss the attributes of a leader.</li><li>Identify the roles a leader can assume.</li></ol>
6.	Utilize team-building skills in class- and work-related situations. <sup>DOK 2</sup> <ol style="list-style-type: none"><li>Define team-building.</li><li>Discuss the attributes of a team.</li><li>Identify the roles included in a team.</li></ol>
7.	Discuss various competitions offered through the CTSO for industrial maintenance. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Describe each of the competitions and the skills needed to accomplish the tasks.</li><li>Perform the tasks needed to complete an assigned requirement for a competition.</li></ol>

**Note:** 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>DOK 2</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>DOK 2</sup> <ol style="list-style-type: none"><li>Apply the tips for developing good listening skills.</li></ol>

## Unit 5: Basic Safety

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<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>DOK 2</sup>	<ol style="list-style-type: none"><li>a. Describe how to avoid on-site accidents.</li><li>b. Explain the relationship between housekeeping and safety.</li><li>c. Explain the importance of following all safety rules and company safety policies according to OSHA standards.</li><li>d. Explain the importance of reporting all on-the-job injuries, accidents, and near misses.</li><li>e. Explain the need for evacuation policies and the importance of following them.</li><li>f. Explain the causes of accidents and the impact of accident costs.</li><li>g. Compare and contrast shop/lab safety rules to industry safety rules.</li></ol>
2. Identify and apply safety around welding operations. <sup>DOK 1</sup>	<ol style="list-style-type: none"><li>a. Use proper safety practices when welding or working around welding operations.</li><li>b. Use proper safety practices when welding in or near trenches and excavations.</li><li>c. 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>a. Explain the safety requirements for working in confined areas.</li><li>b. 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>a. Identify commonly used PPE.</li><li>b. Understand proper use of PPE.</li><li>c. 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>a. Explain the use of proper fall protection.</li><li>b. 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>a. Explain the function of the SDS.</li><li>b. Interpret the requirements of the SDS.</li><li>c. Discuss hazardous material exposures.</li></ol>
7. Display appropriate safety procedures related to fires. <sup>DOK 1</sup>	<ol style="list-style-type: none"><li>a. Explain the process by which fires start.</li><li>b. Explain fire prevention of various flammable liquids.</li><li>c. Explain the classes of fire and the types of extinguishers.</li><li>d. Illustrate the proper steps to follow when using a fire extinguisher.</li><li>e. Demonstrate the proper techniques for putting out a fire.</li></ol>

8. Explain safety in and around electrical situations. <sup>DOK 1</sup>
  - a. Explain the injuries that can result when electrical contact occurs.
  - b. Explain safety around electrical hazards.
  - c. Explain actions to take when an electrical shock occurs.

**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 6: Introduction to Construction Math

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Apply the four basic math skills using whole numbers, fractions, decimals, and percentages, both with and without a calculator. <sup>DOK 2</sup><ol style="list-style-type: none"><li>a. Define basic geometric shapes used in the construction industry.</li><li>b. Add, subtract, multiply, and divide whole numbers, decimals, and fractions with and without a calculator.</li><li>c. Convert whole numbers to fractions and convert fractions to whole numbers.</li><li>d. Convert decimals to percentages and convert percentages to decimals.</li><li>e. Convert fractions to decimals.</li><li>f. Convert fractions to percentages.</li><li>g. Demonstrate reading a standard and metric ruler and a tape measure.</li><li>h. Recognize and use metric units of length, weight, volume, and temperature.</li></ol></li></ol>



## 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>DOK 2</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>DOK 2</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 the basic components of a drawing. <sup>DOK 3</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>DOK 1</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: Tools of the Trade

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Identify and use tools found in the industrial maintenance trade, describe how each is used, and discuss proper care and maintenance of the tools. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Illustrate the use of tools used in the industrial maintenance profession.</li><li>b. Identify and use common hand and power tools used in the industrial maintenance profession.</li></ol></li></ol> |
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## Unit 12: Fasteners and Anchors

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify various fasteners and anchors found in the industrial maintenance trade, how to install and remove fasteners and anchors, and how to select the correct fastener or anchor for an application. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify and install threaded fasteners, non-threaded fasteners, and anchors.</li><li>b. Identify various grades of bolt hardness.</li></ol></li></ol>

## Unit 13: Oxy-Fuel Cutting

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify and describe the basic equipment, setup, and safety rules for proper use of oxy-fuel equipment. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify and explain the use of oxy-fuel equipment.</li><li>b. Demonstrate how to use an oxy-fuel torch.</li><li>c. Perform the following types of oxy-fuel cutting.<ul style="list-style-type: none"><li>• Straight line and square shapes</li><li>• Piercing and slot cutting</li><li>• Bevels</li><li>• Washing</li></ul></li></ol></li></ol>

## Unit 14: Basic Electrical (Industrial Maintenance)

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify electrical safety hazards, demonstrate safety around circuits and equipment, describe basic electricity laws, interpret electrical drawings and schematics, and demonstrate wiring basic electrical circuits. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Describe how voltage, current, resistance, and power are mathematically related.</li><li>b. Describe the difference between series and parallel circuits and calculate loads in each.</li><li>c. Describe the purpose and operation of the various electrical components used in equipment.</li></ol></li><li>2. Explore the various electrical codes and standards such as National Electrical Code (NEC) and Underwriters Laboratories (UL). <sup>DOK2</sup></li></ol>



# Unit 15: Soldering, Brazing, and Copper and Plastic Piping

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<b>Competencies and Suggested Objectives</b>
1. Identify and discuss the tools used in the piping trade, discuss the materials and methods used in connecting piping systems, and perform copper and plastic piping tasks found in the industrial maintenance environment. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Discuss and demonstrate how to use copper tubing in industrial maintenance.</li><li>Discuss and demonstrate how to use plastic tubing in industrial maintenance.</li></ol>
2. Prepare and solder copper piping systems in various industrial maintenance applications and properly clean, install fittings, and braze piping (silver solder). <sup>DOK2</sup> <ol style="list-style-type: none"><li>Solder copper pipe in industrial maintenance.</li><li>Braze copper pipe in industrial maintenance.</li></ol>

## Unit 16: Safety Review and Orientation to the Trade

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<b>Competencies and Suggested Objectives</b>	
1.	Describe local program and career technical center policies and procedures. <sup>DOK2</sup> a. Describe local program and career technical center policies and procedures.
2.	Explore leadership skills and personal development opportunities provided for students by student organizations, including SkillsUSA. <sup>DOK2</sup> a. Demonstrate effective team-building and leadership skills. b. Practice appropriate work ethics.
3.	Discuss orientation to the trade. <sup>DOK2</sup> a. Describe the types of work performed by industrial maintenance craftworkers. b. Identify career opportunities available to industrial maintenance craftworkers. c. Explain the purpose and objectives of an apprentice training program. d. Explain the responsibilities and characteristics of good industrial maintenance craftworkers. e. Explain the importance of safety in relation to industrial maintenance craftworkers. f. Explain the role of NCCER in the training process.
4.	Describe general safety rules for working in a shop/lab and industry. <sup>DOK2</sup> a. Discuss safety issues and prevention associated with the industrial maintenance shop area. b. Explain fire safety and prevention in the workplace.

## Unit 17: Craft-Related Mathematics

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify and explain measuring devices, solve geometric mathematical problems, and use weight and measurement standards. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Discuss mathematics used in the industrial maintenance industry.</li></ol></li></ol>

## Unit 18: Gaskets and Packing

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Identify different types of gaskets and packing materials, list their applications, and install gaskets and packing. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify the various types and materials of gaskets.</li><li>b. Describe the use of O-rings in the industrial maintenance trade.</li><li>c. Describe the uses and methods of packing in the industrial maintenance trade.</li></ol></li></ol> |
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## Unit 19: Pumps and Drivers

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify types of pumps and prime movers and explain pressure differential between the inlet and outlet of pumps. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify and explain centrifugal, rotary, reciprocating, metering, and vacuum pumps.</li><li>b. Explain net positive suction head and cavitation.</li><li>c. Identify types of drivers.</li></ol></li></ol>

## Unit 20: Introduction to Valves

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify types of valves and explain how to store and properly install valves.<sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify types of valves that start, stop, regulate, relieve pressure, and regulate direction of flow.</li><li>b. Explain how to properly store, handle, and mount valves in various locations and positions.</li></ol></li></ol>

## Unit 21: Lubrication

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Describe and explain lubricant classification, additives, uses, and environmental regulations regarding the disposal of oils and greases. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Explain regulatory laws regarding industrial lubricants.</li><li>b. Explain how lubricants protect mechanical machinery.</li><li>c. Explain the properties and handling of lubricants and grease.</li></ol></li></ol> |
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## Unit 22: Construction Drawings

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Identify components of blueprints and scales and perform projects from blueprints. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Read and draw a basic blueprint found in industrial maintenance.</li></ol></li></ol> |
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## Unit 23: Test Equipment

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### Competencies and Suggested Objectives

1. Identify and explain the use of various test equipment used in the trade, differentiate between analog and digital meter readouts, and properly test circuits and mechanisms using available school metering devices.<sup>DOK2</sup>
  - a. Explain the operation of the following pieces of test equipment:
    - Tachometer
    - Pyrometers
    - Multimeters
    - Automated diagnostics tools
    - Wiggy voltage tester
    - Stroboscope
    - Frequency meter
  - b. Explain how to read and convert from one scale to another using the test equipment above.

## Unit 24: Material Handling and Rigging

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### Competencies and Suggested Objectives

1. Identify and explain safe rigging practices, load distribution, hand signals, and rigging equipment. <sup>DOK2</sup>
  - a. Identify, describe the uses of, inspect, and maintain common rigging hardware and equipment, including the following:
    - Jacks
    - Block and tackle
    - Chain hoists
    - Come-alongs
  - b. Tie knots used in rigging.
  - c. Identify basic rigging and crane safety procedures and use the correct hand signals to guide a crane operator.

## Unit 25: Mobile and Support Equipment

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### Competencies and Suggested Objectives

1. Recognize types of mobile and support equipment found in the trade, explain the application for each device, and demonstrate the safe use of the equipment. <sup>DOK2</sup>
  - a. State and explain the safety precautions, operation, and application associated with the use of motor-driven equipment commonly used in industrial plants, including the following:
    - Portable generators
    - Air compressors
    - Aerial lifts
    - Forklifts
    - Mobile cranes
  - b. Operate and perform preventive maintenance on the following equipment:
    - Portable generators
    - Air compressors
    - Aerial lifts

## Unit 26: Hydraulic Systems

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Explain the principles of hydraulic systems. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Discuss safety procedures as applied to hydraulic systems.</li><li>b. Explore the principles of industrial hydraulics.</li></ol></li></ol>

## Unit 27: Pneumatic Systems

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<b>Competencies and Suggested Objectives</b>
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| <ol style="list-style-type: none"><li>1. Explain the principles of pneumatic systems. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Discuss safety procedures as applied to pneumatic systems.</li><li>b. Discuss the principles of industrial pneumatics.</li></ol></li></ol> |
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## Unit 28: Electrical Theory and Conductor Terminations and Splices

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Describe the units of measurement of electricity and the types of circuits, define Ohm's and Kirchhoff's laws, and troubleshoot a simple circuit. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Discuss the properties and physical laws of electricity.</li><li>b. Identify the meters used to measure voltage, current, and resistance.</li><li>c. Discuss the properties of a series and a parallel circuit.</li><li>d. Discuss the properties of alternating currents.</li><li>e. Discuss basic conduit-bending procedures.</li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Identify and make connections using various types of conductors, types of fastening devices, and NEC requirements for terminations and splices. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Describe how to make a conductor termination.</li><li>b. Prepare cable ends for terminations and splices and connect the ends using lugs or connectors.</li><li>c. Train cable at termination points.</li><li>d. Describe the NEC requirements for making cable terminations and splices.</li></ol></li></ol>

## Unit 29: SMAW – Groove Welds with Backing

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Perform basic Shielded Metal Arc Welding (SMAW) welding operations. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Practice safety procedures for SMAW welding operations.</li><li>b. Prepare base metal for SMAW welding.</li><li>c. Demonstrate basic elements and techniques used in SMAW welding.</li><li>d. Fabricate a welding project to specifications.</li></ol></li></ol>

# 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. Describe local program and center expectations, policies, and procedures.
	2. Discuss work-based learning (WBL) opportunities related to program areas.
<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 career and technical student organizations (CTSOs), including SkillsUSA.
	2. Explore the advantages of membership in a CTSO.
	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 CTSO.
<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 and 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 the basic components of a drawing.
<b>Unit 10: Introduction to Materials Handling</b>		
	1.	Safely handle and store materials.
<b>Unit 11: Tools of the Trade</b>		
	1.	Identify and use tools found in the industrial maintenance trade, describe how each is used, and discuss proper care and maintenance of the tools.
<b>Unit 12: Fasteners and Anchors</b>		
	1.	Identify various fasteners and anchors found in the industrial maintenance trade, how to install and remove fasteners and anchors, and how to select the correct fastener or anchor for an application.
<b>Unit 13: Oxy-Fuel Cutting</b>		
	1.	Identify and describe the basic equipment, setup, and safety rules for proper use of oxy-fuel equipment.
<b>Unit 14: Basic Electrical (Industrial Maintenance)</b>		
	1.	Identify electrical safety hazards, demonstrate safety around circuits and equipment, describe basic electricity laws, interpret electrical drawings and schematics, and demonstrate wiring basic electrical circuits.
	2.	Explore the various electrical codes and standards such as National Electrical Code (NEC) and Underwriters Laboratories (UL).

<b>Unit 15: Soldering, Brazing, and Copper and Plastic Piping</b>		
	1.	Identify and discuss the tools used in the piping trade, discuss the materials and methods used in connecting piping systems, and perform copper and plastic piping tasks found in the industrial maintenance environment.
	2.	Prepare and solder copper piping systems in various industrial maintenance applications and properly clean, install fittings, and braze piping (silver solder).
<b>Unit 16: Safety Review and Orientation to the Trade</b>		
	1.	Describe local program and career technical center policies and procedures.
	2.	Explore leadership skills and personal development opportunities provided for students by student organizations, including SkillsUSA.
	3.	Discuss orientation to the trade.
	4.	Describe general safety rules for working in a shop/lab and industry.
<b>Unit 17: Craft-Related Mathematics</b>		
	1.	Identify and explain measuring devices, solve geometric mathematical problems, and use weight and measurement standards.
<b>Unit 18: Gaskets and Packing</b>		
	1.	Identify different types of gaskets and packing materials, list their applications, and install gaskets and packing.
<b>Unit 19: Pumps and Drivers</b>		
	1.	Identify types of pumps and prime movers and explain pressure differential between the inlet and outlet of pumps.
<b>Unit 20: Introduction to Valves</b>		
	1.	Identify types of valves and explain how to store and properly install valves.
<b>Unit 21: Lubrication</b>		
	1.	Describe and explain lubricant classification, additives, uses, and environmental regulations regarding the disposal of oils and greases.
<b>Unit 22: Construction Drawing</b>		
	1.	Identify components of blueprints and scales and perform projects from blueprints.
<b>Unit 23: Test Equipment</b>		
	1.	Identify and explain the use of various test equipment used in the trade, differentiate between analog and digital meter readouts, and properly test circuits and mechanisms using available school metering devices.
<b>Unit 24: Material Handling and Rigging</b>		
	1.	Identify and explain safe rigging practices, load distribution, hand signals, and rigging equipment.

<b>Unit 25: Mobile and Support Equipment</b>		
	1.	Recognize types of mobile and support equipment found in the trade, explain the application for each device, and demonstrate the safe use of the equipment.
<b>Unit 26: Hydraulic Systems</b>		
	1.	Explain the principles of hydraulic systems.
<b>Unit 27: Pneumatic Systems</b>		
	1.	Explain the principles of pneumatic systems.
<b>Unit 28: Electrical Theory and Conductor Terminations and Splices</b>		
	1.	Describe the units of measurement of electricity and the types of circuits, define Ohm's and Kirchhoff's laws, and troubleshoot a simple circuit.
	2.	Identify and make connections using various types of conductors, types of fastening devices, and NEC requirements for terminations and splices.
<b>Unit 29: SMAW Groove Welds with Backing</b>		
	1.	Perform basic Shielded Metal Arc Welding (SMAW) welding operations.

# Appendix A: Industry Standards

## INDUSTRIAL SERVICES PATHWAY

### CONTENT STANDARDS AND PERFORMANCE ELEMENTS<sup>1</sup>

<b>Crosswalk for Industrial Maintenance (Units 1-10)</b>											
	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
BSM						X					
ICM							X				
IHT								X			
IPT									X		
BLU										X	
COM					X						
EMP		X									
IMH											X
OTT											
TOT											
GAP											
FAA											
OXY											
CRM											
CDI											
PAD											
ITV											
ITE											
MHR											
MSE											
LUB											
<b>IME &amp; INSTRUMENTATION TECHNICIAN LEVEL 2</b>											
NEC											
ETO											
CON											
HDC											
PNC											
<b>Welding Level 1</b>											
WES											
BMP											
GWB – SMAW											
<b>HVAC LEVEL 1</b>											
CPP											
SAB											

	Units	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18	Unit 19
BSM							X			
ICM										
IHT										
IPT										
BLU										
COM										
EMP										
IMH										
OTT							X			
TOT		X								

<sup>1</sup> NCCER learning series. Retrieved April 22, 2013, from <http://www.nccer.org/>

GAP									X	
FAA			X							
OXY				X						
CRM								X		
CDI										
PAD										X
ITV										
ITE										
MHR										
MHR										
MSE										
LUB										
<b>IME &amp; INSTRUMENTATION TECHNICIAN LEVEL 2</b>										
NEC					X					
ETO					X					
CON										
HDC									X	
PNC									X	
<b>Welding Level 1</b>										
WES			X							
BMP			X							
GWB – SMAW										
<b>HVAC LEVEL 1</b>										
CPP						X				
SAB						X				

	Units	Unit 20	Unit 21	Unit 22	Unit 23	Unit 24	Unit 25	Unit 26	Unit 27	Unit 28	Unit 29
BSM											
ICM											
IHT											
IPT											
BLU											
COM											
EMP											
IMH											
OTT											
TOT											
GAP											
FAA											
OXY											
CRM											
CDI				X							
PAD											
ITV		X									
ITE					X						
MHR						X					
MSE							X				
LUB			X								
<b>IME &amp; INSTRUMENTATION TECHNICIAN LEVEL 2</b>											
NEC										X	
ETO										X	
CON										X	
HDC								X			
PNC									X		
<b>Welding Level 1</b>											
WES											X
BMP											X
GWB – SMAW											X
<b>HVAC LEVEL 1</b>											
CPP											
SAB											

## **NCCER Core**

**BSM** – BASIC SAFETY (00101-09)  
**ICM** – INTRODUCTION TO CONSTRUCTION MATH (00102-09)  
**IHT** – INTRODUCTION TO HAND TOOLS (00103-09)  
**IPT** – INTRODUCTION TO POWER TOOLS (00104-09)  
**BLU** – INTRODUCTION TO CONSTRUCTION DRAWINGS (00105-09)  
**COM** – BASIC COMMUNICATION SKILLS (00107-09)  
**EMP** – BASIC EMPLOYABILITY SKILLS (00108-09)  
**IMH** – INTRODUCTION TO MATERIALS HANDLING (00109-09)

## **IM E&I Technician Level 1**

**OTT** -- ORIENTATION TO THE TRADE  
**TOT** – TOOLS OF THE TRADE  
**GAP** -- GASKETS AND PACKING  
**FAA** – FASTNERS AND ANCHORS  
**OXY** – OXYFUEL CUTTING  
**CRM** -- CRAFT-RELATED MATHEMATICS  
**CDI** -- CONSTRUCTION DRAWINGS  
**PAD** -- PUMPS AND DRIVERS  
**ITV** -- INTRODUCTION TO VALVES  
**ITE** -- INTRODUCTION TO TEST EQUIPMENT  
**MHR** -- MATERIAL HANDLING AND HAND RIGGING  
**MSE** -- MOBILE AND SUPPORT EQUIPMENT  
**LUB** -- LUBRICATION

## **Industrial Maintenance E&I Technician Level 2**

**NEC** – Introduction to the National Electrical Code  
**ETO** – Electrical Theory  
**CON** – Conductor Terminations and Splices

## **Industrial Maintenance E&I Technician Level 3**

**HDC** – Hydraulic Controls  
**PNC** – Pneumatic Controls

## **Welding Level 1**

**WES** – Welding Safety  
**BMP** - Base Metal Preparation  
**GWB** – SMAW – Groove Welds with Backing

## **HVAC – LEVEL 1**

**CPP** – COPPER AND PLASTIC PIPING  
**SAB** – SOLDERING AND BRAZING





## 2021 Television Broadcasting and Production

Program CIP: 09.0402 – Broadcasting Journalism

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Research and Curriculum Unit  
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 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 television broadcasting and production curriculum is aligned to the following standards:

## **National Career Clusters**

The standards were extensively researched and reviewed by industry leaders, secondary and postsecondary instructors, and university specialists. 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. A complete copy of the standards can be accessed at [careertech.org/arts](http://careertech.org/arts).

## **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 Ready 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

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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 television broadcasting and production program is designed to provide the foundation, skills, and knowledge for developing and producing broadcast-quality materials. Students will learn the skills necessary to work in a television and broadcasting production facility. They will acquire basic and advanced writing and video skills and the ability to provide support in all facets of a production studio. The program will provide hands-on experience in the areas of writing, editing, shooting, directing, and producing for commercial-grade broadcasts.

## **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. 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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## **Option 1—Four 1-Carnegie Unit Courses**

This curriculum consists of four 1-credit courses, which should be completed in the following sequence:

- 1. Television Broadcasting and Production I—Course Code: 994602**
- 2. Television Broadcasting and Production II—Course Code: 994603**
- 3. Television Broadcasting and Production III—Course Code: 994604**
- 4. Television Broadcasting and Production IV—Course Code: 994605**

### **Course Description: Television Broadcasting and Production I**

This course introduces students to television broadcasting and production. Students will leave the class with a firm foundation of knowledge in the areas of employability skills, safety, and basic production knowledge.

### **Course Description: Television Broadcasting and Production II**

This course identifies additional operational areas and their roles within the television and broadcasting production industry. Students will learn how the audio and editing features are incorporated within the industry and the proper techniques to use. Students will also gain an understanding of how to edit, produce, and direct a broadcast production. This course should only be taken after students successfully complete Television Broadcasting and Production I.

### **Course Description: Television Broadcasting and Production III**

This course introduces students to advanced television broadcasting and production. Students will leave the class with further knowledge in the areas of employability skills, safety, and basic production knowledge. Additionally, students will learn advanced scriptwriting fundamentals. This course should only be taken after students successfully complete Television Broadcasting and Production II.

### **Course Description: Television Broadcasting and Production IV**

This course provides a more in-depth view of the production process for video in broadcasting. Students are also introduced to adding music to a production as well as the ethical requirements in the field. This course should only be taken after students successfully complete Television Broadcasting and Production III.

**Television Broadcasting and Production I—Course Code: 994602**

Unit	Unit Name	Hours
1	Orientation, Safety, and Leadership	7
2	Employability Skills	15
3	Introduction to Television and the Production Industry	22
4	Camera Operation and Shot Composition	30
5	Audio for Film and Video	15
6	Basic Television Editing I	18
<b>Total</b>		107

**Television Broadcasting and Production II—Course Code: 994603**

Unit	Unit Title	Hours
7	Basic Television Editing II	18
8	Audio and Television Announcing	15
9	Scriptwriting	24
10	Producing/Directing a Television Program	36
11	Studio/Control Room Equipment	20
<b>Total</b>		113

**Television Broadcasting and Production III—Course Code: 994604**

Unit	Unit Name	Hours
12	Orientation, Safety, and Leadership	7
13	Employability Skills	15
14	Social Media	22
15	Advanced Scriptwriting	30
16	Oral Communication and Public Speaking	24
17	Advanced Video Production I	35
<b>Total</b>		133

**Television Broadcasting and Production IV—Course Code: 994605**

Unit	Unit Name	Hours
18	Advanced Video Production II	35
19	Music in Broadcasting	22
20	Ethics in Journalism	10
21	Senior Project	35
<b>Total</b>		102



## Option 2—Two 2-Carnegie Unit Courses

This curriculum consists of two 2-credit courses, which should be completed in the following sequence:

1. **Broadcasting Journalism I—Course Code:994600**
2. **Broadcasting Journalism II—Course Code: 994601**

### Course Description: Broadcasting Journalism I

This course introduces students to television broadcasting and production. Students will leave the class with a firm foundation of knowledge in the areas of employability skills, safety, and basic production knowledge. Additionally, students will learn scriptwriting fundamentals.

This course identifies additional operational areas and their roles within the television and broadcasting production industry. Students will learn how the audio and editing features are incorporated within the industry and the proper techniques to use. Students will also gain an understanding of how to edit, produce, and direct a broadcast production.

### Course Description: Broadcasting Journalism II

This course introduces students to advanced television broadcasting and production. Students will leave the class with further knowledge in the areas of employability skills, safety, and basic production knowledge. Additionally, students will learn advanced scriptwriting fundamentals.

This course provides a more in-depth view of the production process for video in broadcasting. Students are also introduced to adding music to a production as well as the ethical requirements in the field. This course should be taken after the student has successfully completed Broadcasting Journalism I.

### Broadcasting Journalism I—Course Code 994600

Unit	Unit Name	Hours
1	Orientation, Safety, and Leadership	7
2	Employability Skills	15
3	Introduction to Television and the Production Industry	22
4	Camera Operation and Shot Composition	30
5	Audio for Film and Video	15
6	Basic Television Editing I	18
7	Basic Television Editing II	18
8	Audio and Television Announcing	15
9	Scriptwriting	24
10	Producing/Directing a Television Program	36
11	Studio/Control Room Equipment	20
<b>Total</b>		<b>220</b>

**Broadcasting Journalism II—Course Code: 994601**

Unit	Unit Name	Hours
12	Orientation, Safety, and Leadership	7
13	Employability Skills	15
14	Social Media	22
15	Advanced Scriptwriting	30
16	Oral Communication and Public Speaking	24
17	Advanced Video Production I	35
18	Advanced Video Production II	35
19	Music in Broadcasting	22
20	Ethics in Journalism	10
21	Senior Project	35
<b>Total</b>		<b>235</b>

# Career Pathway Outlook

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## Overview

Television broadcasters operate studios and facilities that program and deliver audiovisual content to the public using over-the-air transmission. Shifts in consumer viewing habits are expected to continuously prompt adjustments by broadcasters. Digital distribution will likely remain an important component of the industry’s strategy as consumers’ relationship to TV content continues to evolve. Although traditional TV viewership is on the decline, the industry is expected to continue growing as it begins shifting to digital streaming platforms.

Broadcast and sound technicians typically need postsecondary education. Depending on the work they do, they may need either a postsecondary nondegree award or an associate degree. Employers generally prefer to hire broadcast news analysts who have a bachelor’s degree in journalism or communications along with an internship or work experience in the field.

## Needs of the Future Workforce

Employment in the TV broadcasting industry is expected to grow at a faster rate than the average for other occupations. Data for this synopsis were compiled from employment projections prepared by the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (2019), and the Mississippi Department of Employment Security (2019).

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2019
Audio and Video Equipment Technicians	160	170	10	6.3	\$15.97
Broadcast News Analysts	80	90	10	12.5	\$36.00
Broadcast Technicians	170	180	10	5.9	\$17.79
Producers and Directors	310	350	40	12.9	\$21.30

Source: Mississippi Department of Employment Security; [mdes.ms.gov](http://mdes.ms.gov) (2019).

## Perkins V Requirements and Academic Infusion

The television broadcasting and production curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in the television broadcasting and production field. 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 television broadcasting and production. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, the curriculum 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 television broadcasting and production 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.

### *Career and Technical Education Student Organizations*

Teachers should investigate opportunities to sponsor a student organization. In Mississippi, SkillsUSA and Technology Student Association (TSA) foster the types of learning expected from the television broadcasting and production curriculum. SkillsUSA and TSA prepare emerging leaders and entrepreneurs for careers in the television broadcasting and production industry.

### *Cooperative Learning*

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities in the television broadcasting and production 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 television broadcasting and production curriculum provides opportunities for students to work together and help each other to complete complex tasks.

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the HVAC 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 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)

Technology Student Association (TSA)

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

# Using This Document

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## **Suggested Time on Task**

This section indicates an estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80% of the time in the course. The remaining percentage of class time will include instruction in non-tested material, review for end-of-course testing, and special projects.

## **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 television broadcasting and production 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 television broadcasting and production 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, Safety, and Leadership

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<b>Competencies and Suggested Objectives</b>
1. Describe local program and career center policies and procedures. <sup>DOK1</sup> a. Describe local program and career center policies and procedures, including dress code, attendance, academic requirements, discipline, and transportation regulations.
2. State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided to students by student organizations. <sup>DOK1</sup> a. State procedures of leadership used in organizational meetings to reach an agreement in an orderly manner. b. Describe the purposes of the appropriate student organization.
3. Identify legal requirements for participation in the occupation. <sup>DOK1</sup> a. Describe ways to avoid legal liability problems in the occupation.
4. Describe personal safety rules for working in the audio and television broadcasting industry. <sup>DOK1</sup> a. Identify and apply terms and definitions for safety. b. Identify provisions of the OSHA Act of 1970. c. Identify OSHA inspections and citations. d. Identify why citations are given. e. Identify accidents, their causes, and prevention. f. Identify general safety procedures. g. Identify causes of electrical hazards. h. Identify proper methods for moving heavy items. i. Identify and apply emergency first aid, if necessary. j. Identify and apply the ABCs of CPR.

**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 2: Employability Skills

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<b>Competencies and Suggested Objectives</b>	
1. Describe employment opportunities in the television broadcasting industry. <sup>DOK 1</sup>	a. Describe employment opportunities, including potential earnings, employee benefits, job availability, working conditions, educational requirements, required technology skills, and continuing education/training.
2. Examine the Mississippi Department of Employment Security (MDES) website and its applications relating to employment opportunities. <sup>DOK 1</sup>	a. Perform various searches through the MDES website, such as: <ul style="list-style-type: none"><li>• Number of jobs available for a specific area of expertise</li><li>• Hourly wage</li><li>• Percentage of jobs in the county</li><li>• Percentage of jobs in the state</li></ul>
3. Describe basic employee responsibilities and appropriate work ethics. <sup>DOK 1</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.
4. Analyze desirable behavior and characteristics in the workplace. <sup>DOK1</sup>	a. Model desirable personality traits when serving the public. b. Exhibit desirable personality traits when communicating with employees, supervisors, and other employees. c. Demonstrate desirable characteristics of personal work ethic.



## Unit 3: Introduction to the Television and Production Industry

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<b>Competencies and Suggested Objectives</b>
1. Analyze the development of broadcasting as an industry. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Discuss the history of the television production and broadcasting industry.</li><li>Explain the difference between linear and nonlinear video editing .</li><li>Analyze past, present, and future trends in the television industry.</li><li>Differentiate between various TV formats.</li></ol>
2. Compare and contrast the components of the broadcasting industry. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Explain, compare, and contrast program types.</li><li>Explore various news sources such as digital, television (local and national), and nontraditional methods.</li><li>Identify occupations in the television production industry.</li></ol>

## Unit 4: Camera Operation and Shot Composition

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Identify uses of the video camera. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Demonstrate the basic fundamentals of camera setup and operation.</li><li>b. Identify and demonstrate the effective use of various camera shots, angles, and movements for video production.</li><li>c. Experience field recording using portable video equipment; operate television cameras.</li><li>d. Demonstrate on-camera performance techniques necessary in TV production e.g. hand-held shooting, tripod shooting, etc.</li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Apply advanced camera operations in a real-world setting. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Exemplify how white balancing affects the picture.</li><li>b. Demonstrate how depth-of-field contributes to composing a good picture.</li><li>c. Experience remote shooting vs. studio shooting.</li></ol></li></ol>

## Unit 5: Audio for Film and Video

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<b>Competencies and Suggested Objectives</b>	
1.	Demonstrate the audio setup for a production. <sup>DOK2</sup>
2.	Utilize microphone techniques used by television broadcasting talent. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Identify different types of microphones and techniques used by television broadcasting talent.</li></ol>
3.	Explain the purpose and use of music in a production. <sup>DOK2</sup> . <ol style="list-style-type: none"><li>Demonstrate an understanding of copyright law and fair use practices.</li><li>Create personal music (using audio production software) for film/video, television shows, commercials, public service announcements (PSAs), and documentaries.</li></ol>

## Unit 6: Basic Television Editing I

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<b>Competencies and Suggested Objectives</b>	
1.	Explain the purpose of editing digital video for a television broadcast. <sup>DOK2</sup>
	a. Identify editing terms.
	b. Identify the purpose of editing a video file.
	c. Identify the tools used for editing.

## Unit 7: Basic Television Editing II

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Demonstrate the ability to operate nonlinear television editing equipment. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify the parts of a nonlinear television editing system.</li><li>b. Demonstrate an ability to edit a video file using a nonlinear editing system.</li></ol></li></ol>

## Unit 8: Audio and Television Announcing

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<b>Competencies and Suggested Objectives</b>	
1.	Demonstrate the ability to announce effectively. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Identify and demonstrate the speech process.</li><li>Perform voice and diction exercises.</li><li>Read scripts (both with and without a teleprompter) in front of a microphone and on camera using your professional voice.</li></ol>
2.	Demonstrate effective communication techniques. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Explain and discuss how to ad-lib, interview guests, and read news stories in front of the camera.</li><li>Demonstrate an ability to ad-lib during a production, interview guests, and read news stories on camera.</li></ol>

## Unit 9: Scriptwriting

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### Competencies and Suggested Objectives

1. Demonstrate the ability to write audio and television production scripts. <sup>DOK2</sup>
  - a. Analyze professional audio and television broadcasting scripts.
  - b. Research a chosen subject.
  - c. Identify an audience.
  - d. Use appropriate language.
  - e. Assemble audio cues, video cues, and spoken words into a rough draft.
  - f. Revise the script to fit the time allotted.
  - g. Edit the script to remove mechanical, grammatical, and usage errors.
  - h. Write a complete script for various productions, including a newscast, talk show, sports show, interview show, commercials (30 seconds and 60 seconds), and public service announcements (30 seconds and 60 seconds).
2. Demonstrate the ability to write for television productions. <sup>DOK2</sup>
  - a. Describe the five Ws and one H.
  - b. Demonstrate how to create a lead.
  - c. Describe the inverted pyramid writing style.
  - d. Demonstrate how to create a story headline.
  - e. Compare and contrast hard news vs. soft news.
  - f. Compare and contrast national, world, and local news.

## Unit 10: Producing/Directing a Television Program

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### Competencies and Suggested Objectives

1. Demonstrate the ability to produce a television program. <sup>DOK2</sup>
  - a. Review professional productions.
  - b. Identify production types, formats of programs, and productions.
  - c. Define an audience and assess its role.
  - d. Formulate a program idea.
  - e. Collect ideas and materials for the program.
  - f. Produce a script for various types and formats.
  - g. Convert a script to final production.
2. Demonstrate the procedures for directing television productions. <sup>DOK2</sup>
  - a. Identify and use a director's terminology.
  - b. Analyze a script.
  - c. Plan a program to meet time constraints.
  - d. Direct a rehearsal.
  - e. Direct a program for recording.
  - f. Utilize various hand signals used in television broadcasting to cue on-camera talent.
  - g. Evaluate program performance.



# Unit 11: Studio/Control Room Equipment

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Demonstrate the ability to use basic television production equipment. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify the functions of studio cameras, camera control units, teleprompters, video switchers, character generators, and studio intercom systems.</li><li>b. Identify the different types of lighting for television production.</li><li>c. Operate studio cameras, camera control units, teleprompters, video switchers, character generators, and studio intercom systems.</li><li>d. Demonstrate appropriate lighting for television studio productions and field productions.</li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Demonstrate the ability to operate audio control room equipment. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Identify the functions of an audio control console, microphone mixer, and waveform.</li><li>b. Operate an audio control console, microphone mixer, and waveform.</li><li>c. Identify the various microphones used in television broadcasting and production.</li><li>d. Demonstrate how to use various microphones.</li><li>e. Apply the techniques of a beginning audio control operator.</li></ol></li></ol>

## Unit 12: Orientation, Safety, and Leadership

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<b>Competencies and Suggested Objectives</b>	
1. Describe local program and career center policies and procedures. <sup>DOK1</sup>	a. Describe local program and career center policies and procedures, including dress code, attendance, academic requirements, discipline, and transportation regulations.
2. State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided to students by student organizations. <sup>DOK1</sup>	a. State procedures of leadership used in organizational meetings to reach an agreement in an orderly manner. b. Describe the purposes of the appropriate student organization.
3. Identify legal requirements for participation in the occupation. <sup>DOK1</sup>	a. Describe ways to avoid legal liability problems in the occupation.
4. Describe personal safety rules for working in the audio and television broadcasting industry. <sup>DOK1</sup>	a. Identify and apply terms and definitions for safety. b. Identify provisions of the OSHA Act of 1970. c. Identify OSHA inspections and citations. d. Identify why citations are given. e. Identify accidents, their causes, and prevention. f. Identify general safety procedures. g. Identify causes of electrical hazards. h. Identify proper methods for moving heavy items. i. Identify and apply emergency first aid, if necessary. j. Identify and apply the ABCs of CPR.

**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 13: Employability Skills

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<b>Competencies and Suggested Objectives</b>
1. Develop and emphasize employability skills. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Analyze a résumé.</li><li>Describe the parts of a résumé.</li><li>Prepare a résumé containing essential information.</li><li>Complete a job application form</li></ol>
2. Describe employment opportunities in the television broadcasting industry. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Describe employment opportunities, including potential earnings, employee benefits, job availability, working conditions, educational requirements, required technology skills, and continuing education/training.</li></ol>
3. Examine the Mississippi Department of Employment Security (MDES) website and its applications relating to employment opportunities. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Perform various searches through the MDES website, such as:<ul style="list-style-type: none"><li>Number of jobs available for a specific area of expertise</li><li>Hourly wages</li><li>Percentage of jobs in the county</li><li>Percentage of jobs in the state</li></ul></li></ol>
4. Demonstrate appropriate interview skills. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Identify interview skills such as speaking, dress, professionalism, and punctuality.</li><li>Simulate a job interview.</li></ol>
5. Describe basic employee responsibilities and appropriate work ethics. <sup>DOK 1</sup> <ol style="list-style-type: none"><li>Compare and contrast employment responsibilities and expectations to local school and program policies and expectations.</li><li>Define effective relationship skills and workplace issues, including, but not limited to sexual harassment, stress, and substance abuse.</li></ol>
6. Analyze desirable behavior and characteristics in the workplace. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Model desirable personality traits when serving the public.</li><li>Exhibit desirable personality traits when communicating with employees, supervisors, and other employees.</li><li>Demonstrate desirable characteristics of personal work ethic.</li></ol>
7. Create a digital portfolio of student products to include a résumé, videos, a demo reel, a senior project, etc. (Ongoing throughout the year)

## Unit 14: Social Media and Nontraditional Media

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<b>Competencies and Suggested Objectives</b>
1. Describe social media and its use in television. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Describe how social media is used in our society.</li><li>Describe the historical perspective of social media.</li><li>Compare and contrast different social media platforms, including Facebook, Twitter, and Instagram.</li><li>Demonstrate writing for social media.</li><li>Conduct a media analysis to discover how companies use social media.</li><li>Describe the First Amendment and social media.</li><li>Analyze the future of social media.</li></ol>
2. Explore nontraditional media opportunities. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Produce a video for a YouTube audience.</li><li>Investigate freelance videography opportunities.</li><li>Produce a vlog for a given audience.</li></ol>

## Unit 15: Advanced Scriptwriting

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<b>Competencies and Suggested Objectives</b>	
1. Demonstrate writing for news outlets. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Explain careers in news.</li><li>b. Demonstrate story organization.</li><li>c. Demonstrate writing the lead.</li><li>d. Demonstrate writing using the inverted pyramid.</li></ol>
2. Demonstrate writing for the screen. <sup>DOK2</sup>	<ol style="list-style-type: none"><li>a. Explain careers in film.</li><li>b. Demonstrate structuring the story.</li><li>c. Demonstrate writing a short script.</li></ol>

## Unit 16: Oral Communication and Public Speaking

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<b>Competencies and Suggested Objectives</b>	
1. Discuss and demonstrate uses of oral communication skills. <sup>DOK2</sup>	<ul style="list-style-type: none"><li>a. Discuss the importance of good speech.</li><li>b. Discuss the elements of communication.</li><li>c. Discuss oral communication techniques.</li><li>d. Discuss aspects of speaking on camera, including articulation, delivery, and transitioning.</li></ul>
2. Produce a segment that demonstrates communication techniques. <sup>DOK2</sup>	<ul style="list-style-type: none"><li>a. Talk show</li><li>b. Debate</li><li>c. Hot topic</li></ul>

## Unit 17: Advanced Video Production I

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<b>Competencies and Suggested Objectives</b>	
1. Demonstrate the ability to produce a news package. <sup>DOK2</sup>	
a. Describe the parts of a news package.	
b. Writing for a news package.	
c. Producing a news package.	
2. Demonstrate the ability to produce a PSA. <sup>DOK2</sup>	
a. Describe a PSA.	
b. Write a PSA.	
c. Produce a PSA.	

## Unit 18: Advanced Video Production II

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<b>Competencies and Suggested Objectives</b>	
1. Demonstrate the ability to produce a commercial/promo. <sup>DOK2</sup>	
a. Describe a commercial/promo.	
b. Write a commercial/promo.	
c. Produce a commercial/promo.	
2. Demonstrate the ability to produce a news segment. <sup>DOK2</sup>	
a. Write a news story.	
b. Organize the news stories.	
c. Produce a news segment.	



# Unit 19: Music in Broadcasting

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<b>Competencies and Suggested Objectives</b>	
1. Analyze the use of music in film and video projects. <sup>DOK2</sup>	
a. Contrast background music with foreground music.	
b. Describe copyrighted and recorded music.	
2. Demonstrate composing music for film using audio production software. <sup>DOK2</sup>	
a. Complete a music composition for a promo.	
b. Create, produce, and direct a music video.	

## Unit 20: Ethics in Journalism

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<b>Competencies and Suggested Objectives</b>
1. Identify the rights and limitations of the First Amendment. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Demonstrate ethical decision-making.</li><li>Discuss censorship, libel, privacy laws, and copyright law.</li><li>Discuss the code of ethics for journalists.</li><li>Discuss accuracy, objectivity, and credibility.</li></ol>
2. Discuss current cases of ethics in broadcasting. <sup>DOK2</sup>

## Unit 21: Senior Project

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Demonstrate the production and broadcasting skills acquired throughout the two-year program.<sup>DOK2</sup><ol style="list-style-type: none"><li>a. Produce a project based on your production/broadcasting skills.</li><li>b. Present a project based on your production/broadcasting skills.</li></ol></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: Orientation, Safety, and Leadership</b>		
	1.	Describe local program and career center policies and procedures.
	2.	State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided to students by student organizations.
	3.	Identify legal requirements for participation in the occupation.
	4.	Describe personal safety rules for working in the audio and television broadcasting industry.
<b>Unit 2: Employability Skills</b>		
	1.	Describe employment opportunities in the television broadcasting industry.
	2.	Examine the Mississippi Department of Employment Security (MDES) website and its applications relating to employment opportunities.
	3.	Describe basic employee responsibilities and appropriate work ethics.
	4.	Analyze desirable behavior and characteristics in the workplace.
<b>Unit 3: Introduction to Television and the Production Industry</b>		
	1.	Analyze the development of broadcasting as an industry.
	2.	Compare and contrast the components of the broadcasting industry.
<b>Unit 4: Camera Operation and Shot Composition</b>		
	1.	Identify uses of the video camera.
	2.	Apply advanced camera operations in a real-world setting.
<b>Unit 5: Audio for Film and Video</b>		
	1.	Demonstrate the audio setup for a production.
	2.	Utilize microphone techniques used by television broadcasting talent.
	3.	Explain the purpose and use of music in a production.
<b>Unit 6: Basic Television Editing I</b>		
	1.	Explain the purpose of editing digital video for a television broadcast.

<b>Unit 7: Basic Television Editing II</b>		
	1.	Demonstrate the ability to operate nonlinear television editing equipment.
<b>Unit 8: Audio and Television Announcing</b>		
	1.	Demonstrate the ability to announce effectively.
	2.	Demonstrate effective communication techniques.
<b>Unit 9: Scriptwriting</b>		
	1.	Demonstrate the ability to write audio and television production scripts.
	2.	Demonstrate the ability to write for television productions.
<b>Unit 10: Producing/Directing a Television Program</b>		
	1.	Demonstrate the ability to produce a television program.
	2.	Demonstrate the procedures for directing television productions.
<b>Unit 11: Studio/Control Room Equipment</b>		
	1.	Demonstrate the ability to use basic television production equipment.
	2.	Demonstrate the ability to operate audio control room equipment.
<b>Unit 12: Orientation, Safety, and Leadership</b>		
	1.	Describe local program and career center policies and procedures.
	2.	State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided to students by student organizations.
	3.	Identify legal requirements for participation in the occupation.
	4.	Describe personal safety rules for working in the audio and television broadcasting industry.
<b>Unit 13: Employability Skills</b>		
	1.	Develop and emphasize employability skills.
	2.	Describe employment opportunities in the television broadcasting industry.
	3.	Examine the Mississippi Department of Employment Security (MDES) website and its applications relating to employment opportunities.
	4.	Demonstrate appropriate interview skills.
	5.	Describe basic employee responsibilities and appropriate work ethics.
	6.	Analyze desirable behavior and characteristics in the workplace.
	7.	Create a digital portfolio of student products to include a résumé, videos, a demo reel, a senior project, etc. (Ongoing throughout the year)
<b>Unit 14: Social Media and Nontraditional Media</b>		
	1.	Describe social media and its use in television.
	2.	Explore nontraditional media opportunities.

<b>Unit 15: Advanced Scriptwriting</b>		
	1.	Demonstrate writing for news outlets.
	2.	Demonstrate writing for the screen.
<b>Unit 16: Oral Communication and Public Speaking</b>		
	1.	Discuss and demonstrate uses of oral communication skills.
	2.	Produce a segment that demonstrates communication techniques.
<b>Unit 17: Advanced Video Production I</b>		
	1.	Demonstrate the ability to produce a news package.
	2.	Demonstrate the ability to produce a PSA.
<b>Unit 18: Advanced Video Production II</b>		
	1.	Demonstrate the ability to produce a commercial/promo.
	2.	Demonstrate the ability to produce a news segment.
<b>Unit 19: Music in Broadcasting</b>		
	1.	Analyze the use of music in film and video projects.
	2.	Demonstrate composing music for film using audio production software.
<b>Unit 20: Ethics in Journalism</b>		
	1.	Identify the rights and limitations of the First Amendment.
	2.	Discuss current cases of ethics in broadcasting.
<b>Unit 21: Senior Project</b>		
	1.	Demonstrate the production and broadcasting skills acquired throughout the two-year program.

# Appendix A: Industry Standards

## National Career Clusters

Crosswalk for Television Broadcasting and Production												
	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11
AVT1				X			X	X			X	
AVT2		X			X	X	X	X	X	X	X	
AVT3					X	X	X	X	X	X	X	X
AVT4							X	X		X	X	X
JBC1			X	X								
JBC2										X		
JBC3						X				X		
JBC4					X		X	X	X	X	X	
WDC1												X
WDC2												
WDC3												
WDC4												
WDC5												
WDC6												
WDC7												
WDC8												
WDC9												
WDC10											X	

		Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18	Unit 19	Unit 20	Unit 21	
AVT1		X	X			X	X	X	X		X	
AVT2				X			X	X			X	
AVT3							X	X	X		X	
AVT4							X	X	X		X	
JBC1						X	X	X			X	
JBC2					X	X	X	X			X	
JBC3							X	X			X	
JBC4							X	X			X	
WDC1											X	
WDC2											X	
WDC3											X	
WDC4					X						X	
WDC5											X	
WDC6											X	
WDC7											X	
WDC8											X	
WDC9											X	
WDC10					X				X	X	X	

### A/V Technology & Film Career Pathway (AR-AV)

- AVT1. Describe the history, terminology, occupations and value of audio, video and film technology.
- AVT2. Demonstrate the use of basic tools and equipment used in audio, video and film production.
- AVT3. Demonstrate technical support skills for audio, video and/or film productions.
- AVT4. Design an audio, video and/or film production.



### **Journalism & Broadcasting Career Pathway (AR-JB)**

- JBC1. Describe the diversity of functions within the Journalism & Broadcasting Career Pathway.
- JBC2. Demonstrate writing processes used in journalism and broadcasting.
- JBC3. Plan and deliver a media production (e.g., broadcast, video, Internet, mobile).
- JBC4. Demonstrate technical support related to media production (e.g., broadcast, video, Internet, mobile).

### **Web & Digital Communications Career Pathway (IT-WD)**

- WDC1. Analyze customer requirements to design and develop a Web or digital communication product.
- WDC 2. Apply the design and development process to produce user-focused Web and digital communications solutions.
- WDC 3. Write product specifications that define the scope of work aligned to customer requirements.
- WDC4. Demonstrate the effective use of tools for digital communication production, development and project management.
- WDC5. Develop, administer and maintain Web applications.
- WDC6. Design, create and publish a digital communication product based on customer needs.
- WDC7. Evaluate the functionality of a digital communication product using industry accepted techniques and metrics.
- WDC8. Implement quality assurance processes to deliver quality digital communication products and services.
- WDC9. Perform maintenance and customer support functions for digital communication products.
- WDC10. Comply with intellectual property laws, copyright laws and ethical practices when creating Web/digital communications.





## 2021 Keystone

Program CIP: 37.0103 Personal Decision-Making Skills

Direct inquiries to:

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Research and Curriculum Unit  
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Mississippi State, MS 39762  
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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 Keystone curriculum is aligned to the following standards:

## **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 Ready 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.

[mde.k12.ms.us/mccrs](http://mde.k12.ms.us/mccrs)

## **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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## **Course Description**

Keystone is a course to be taught in either seventh, eighth, or ninth grade and is to be used as an introduction to career pathways and career decision-making. The course was developed specifically to meet the needs of those schools participating in career academies. This introductory course includes content in self-development, career clusters, pathways, and choices, as well as financial planning. The course is designed to be taught in a “flipped” classroom environment where students are introduced to the content outside of class and experience the content during class.

## **Grade Level and Class Size**

Students should be enrolled in seventh, eighth, or ninth grade in order to take Keystone. 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 such as this.

## **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 Outline

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## Keystone—Course Code: 990002

Unit	Unit Name	Hours
1	Orientation, Course Introduction, and Ethics	15
2	Learning and Personality Styles	5
3	The 16 National Career Clusters: Agriculture, Food and Natural Resources	5
4	The 16 National Career Clusters: Architecture and Construction	5
5	The 16 National Career Clusters: Arts, A/V Technology and Communications	5
6	The 16 National Career Clusters: Business Management and Administration	5
7	The 16 National Career Clusters: Education and Training	5
8	The 16 National Career Clusters: Finance	5
9	The 16 National Career Clusters: Government and Public Administration	5
10	The 16 National Career Clusters: Health Science	5
11	The 16 National Career Clusters: Hospitality and Tourism	5
12	The 16 National Career Clusters: Human Services	5
13	The 16 National Career Clusters: Information Technology	5
14	The 16 National Career Clusters: Law, Public Safety, Corrections and	5
15	The 16 National Career Clusters: Manufacturing	5
16	The 16 National Career Clusters: Marketing	5
17	The 16 National Career Clusters: Science, Technology, Engineering and Math	5
18	The 16 National Career Clusters: Transportation, Distribution and Logistics	5
19	Financial Literacy/Reality Fair	20
20	College and Career Focus	20
<b>Total</b>		<b>140</b>

# Career Pathway Outlook

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## Overview

The Keystone course provides an overview of the 16 Career Clusters in the National Career Clusters Framework. The overview will consist of various jobs, earnings, and requirements for students to explore throughout the course.

## Needs of the Future Workforce

Data for this synopsis were compiled from employment projections prepared by the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (2019), and the Mississippi Department of Employment Security (2019).

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2016	Projected Jobs, 2026	Change (Number)	Change (Percent)	Average Hourly Earnings, 2019
Management Occupations	63,150	68,070	4,920	7.8	\$39.19
Business and Financial Operations Occupations	32,730	34,440	1,710	5.2	\$29.23
Computer and Mathematical Occupations	12,210	13,030	820	6.7	\$33.62
Architecture and Engineering Occupations	15,320	16,410	1,090	7.1	\$36.01
Life, Physical, and Social Science Occupations	7,260	7,660	400	5.5	\$29.84
Community and Social Service Occupations	15,120	16,490	1,370	9.1	\$18.99
Legal Occupations	6,040	6,300	260	4.3	\$35.75
Education, Training, and Library Occupations	77,340	84,310	6,970	9.0	\$21.24
Arts, Design, Entertainment, Sports, and Media Occupations	8,660	8,880	220	2.5	\$22.35
Healthcare Practitioners and Technical Occupations	78,060	84,220	6,160	7.9	\$30.86
Healthcare Support Occupations	31,400	34,830	3,430	10.9	\$12.37
Protective Service Occupations	32,540	33,690	1,150	3.5	\$15.90
Food Preparation and Serving Related Occupations	97,530	109,540	12,010	12.3	\$10.16
Building and Grounds Cleaning and Maintenance Occupations	39,020	42,480	3,460	8.9	\$11.34
Personal Care and Service Occupations	34,890	38,320	3,430	9.8	\$11.22
Sales and Related Occupations	122,620	127,230	4,610	3.8	\$14.61

Office and Administrative Support Occupations	171,440	168,460	(2,980)	(1.7)	\$15.61
Farming, Fishing, and Forestry Occupations	13,980	13,700	(280)	(2.0)	\$17.64
Construction and Extraction Occupations	44,980	47,290	2,310	5.1	\$19.24
Installation, Maintenance, and Repair Occupations	54,030	57,420	3,390	6.3	\$20.82
Production Occupations	103,140	103,960	820	0.8	\$16.92
Transportation and Material Moving Occupations	92,550	97,530	4,980	5.4	\$16.01

*Source:* Mississippi Department of Employment Security; [mdes.ms.gov](http://mdes.ms.gov) (2019).

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

The Keystone curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for fitness and nutrition careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, the curriculum 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 instructor'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—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 Keystone curriculum. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to 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 Keystone 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 Keystone curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the Keystone curriculum that will allow and encourage collaboration with professionals in a variety of fields.

### *Project-Based Learning*

The Keystone curriculum is intended to be taught in a student-led, inquiry-based, flipped classroom environment. It is important that the career cluster units in particular be taught in the flipped classroom environment. Students should develop projects based on what they want to research and learn about each cluster. The flipped classroom model suggests that much of this research and information-gathering is done *outside* of the classroom, while project work takes place during class time. For more information, please visit [jonbergmann.com](http://jonbergmann.com).

### *Work-Based Learning*

Work-based learning is an extension of understanding competencies taught in the Keystone 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 professionals. Thus, supervised collaboration and immersion into the industry around students are keys to students' success, knowledge, and skills development.

# Professional Organizations

---

Association of Career and Technical Education  
[acteonline.org](http://acteonline.org)

Distributive Education Clubs of America  
[deca.org](http://deca.org)

Family, Career, and Community Leaders of America  
[fcclainc.org](http://fcclainc.org)

Future Business Leaders of America  
[fbla-pbl.org](http://fbla-pbl.org)

Future Educators of America  
[futureeducators.org](http://futureeducators.org)

Future Farmers of America  
[ffa.org](http://ffa.org)

Health Occupational Students of America  
[hosa.org](http://hosa.org)

Mississippi Association of Career and Technical Education  
[mississippiacte.com](http://mississippiacte.com)

SkillsUSA  
[skillsusa.org](http://skillsusa.org)

Technology Student Association  
[tsaweb.org](http://tsaweb.org)

# Using This Document

---

## **Suggested Time on Task**

This section indicates an estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80% of the time in the course. The remaining percentage of class time will include instruction in non-tested material, review for end-of-course testing, and special projects.

## **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 Keystone 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 Keystone 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, Course Introduction, and Ethics

---

<b>Competencies and Suggested Objectives</b>	
1. Describe course expectations, school policies, and safety procedures. <sup>DOK1</sup>	
a. Identify student expectations and policies for the course.	
b. Describe the operating procedures for the equipment utilized in the class.	
2. Understand the importance of employability skills to be successful in the workplace. <sup>DOK1</sup>	
a. Demonstrate effective written and verbal communication skills.	
b. Identify proper attire and appearance required for the workplace.	
c. Understand interpersonal skills and the ability to work well with others.	
d. Identify ethical behavior and the proper use of technology in the workplace.	
3. Explore student organizations related to the sixteen national career clusters. <sup>DOK1</sup>	
a. Discuss leadership and personal development in accordance with student organizations.	
b. Describe parliamentary procedure.	
c. Discuss officer roles and responsibilities.	

## Unit 2: Learning and Personality Styles

---

<b>Competencies and Suggested Objectives</b>
1. Discover learning and personality styles. <sup>DOK1</sup> <ol style="list-style-type: none"><li>Complete learning and personality style inventories.</li><li>Identify elements that shape personality development.<ul style="list-style-type: none"><li>• Character traits</li><li>• Heredity</li><li>• Environment</li></ul></li><li>Identify conflicts between personality, management styles, and work techniques to manage in the workplace and life.</li></ol>
2. Develop characteristics of highly effective people. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Participate in activities that strengthen self-motivation.</li><li>Recognize the importance of time management and personal responsibility.</li></ol>

## Unit 3: Agriculture, Food and Natural Resources

---

### Competencies and Suggested Objectives

1. Understand career opportunities in the agriculture, food and natural resources career cluster. <sup>DOK2</sup>
  - a. Research the occupational outlook for jobs in the agriculture, food and natural resources career cluster.
    - Career pathways
    - Education and training
    - Salaries
    - Aptitudes
2. Identify the significance of the agriculture, food and natural resources career cluster in society. <sup>DOK3</sup>
  - a. Research the relationship of careers in agriculture, food and natural resources to society and other careers.
  - b. Participate in a real-world job scenario associated with the agriculture, food and natural resources career cluster.

## Unit 4: Architecture and Construction

---

<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Understand career opportunities in the architecture and construction career cluster. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the occupational outlook for jobs in the architecture and construction career cluster.<ul style="list-style-type: none"><li>• Career pathways</li><li>• Education and training</li><li>• Salaries</li><li>• Aptitudes</li></ul></li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Identify the significance of the architecture and construction career cluster in society. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the relationship of careers in architecture and construction to society and other careers.</li><li>b. Participate in a real-world job scenario associated with the architecture and construction career cluster.</li></ol></li></ol>

## Unit 5: Arts, A/V Technology and Communications

---

### **Competencies and Suggested Objectives**

1. Understand career opportunities in the arts, audio/video technology and communications career cluster. <sup>DOK2</sup>
  - a. Research the occupational outlook for jobs in the arts, audio/video technology and communications career cluster.
    - Career pathways
    - Education and training
    - Salaries
    - Aptitudes
2. Identify the significance of the arts, audio/video technology and communications career cluster in society. <sup>DOK2</sup>
  - a. Research the relationship of careers in arts, audio/video technology and communications to society and other careers.
  - b. Participate in a real-world job scenario associated with the arts, audio/video technology and communications career cluster.

## Unit 6: Business Management and Administration

---

### Competencies and Suggested Objectives

1. Understand career opportunities in the business management and administration career cluster. <sup>DOK2</sup>
  - a. Research the occupational outlook for jobs in the business management and administration career cluster.
    - Career pathways
    - Education and training
    - Salaries
    - Aptitudes
2. Identify the significance of the business management and administration career cluster in society. <sup>DOK2</sup>
  - a. Research the relationship of careers in business management and administration to society and other careers.
  - b. Participate in a real-world job scenario associated with the business management and administration career cluster.

## Unit 7: Education and Training

---

<b>Competencies and Suggested Objectives</b>
1. Understand career opportunities in the education and training career cluster. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Research the occupational outlook for jobs in the education and training career cluster.<ul style="list-style-type: none"><li>Career pathways</li><li>Education and training</li><li>Salaries</li><li>Aptitudes</li></ul></li></ol>
2. Identify the significance of the education and training career cluster in society. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Research the relationship of careers in education and training to society and other careers.</li><li>Participate in a real-world job scenario associated with the education and training career cluster.</li></ol>

## Unit 8: Finance

---

<b>Competencies and Suggested Objectives</b>
1. Understand career opportunities in the finance career cluster. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Research the occupational outlook for jobs in the finance career cluster.<ul style="list-style-type: none"><li>Career pathways</li><li>Education and training</li><li>Salaries</li><li>Aptitudes</li></ul></li></ol>
2. Identify the significance of the finance career cluster in society. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Research the relationship of careers in finance to society and other careers.</li><li>Participate in a real-world job scenario associated with the finance career cluster.</li></ol>

- Career pathways
- Education and training
- Salaries
- Aptitudes



## Unit 9: Government and Public Administration

---

### **Competencies and Suggested Objectives**

1. Understand career opportunities in the government and public administration career cluster. <sup>DOK2</sup>
  - a. Research the occupational outlook for jobs in the government and public administration career cluster.
    - Career pathways
    - Education and training
    - Salaries
    - Aptitudes
2. Identify the significance of the government and public administration career cluster in society. <sup>DOK2</sup>
  - a. Research the relationship of careers in government and public administration to society and other careers.
  - b. Participate in a real-world job scenario associated with the government and public administration career cluster.

## Unit 10: Health Science

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<b>Competencies and Suggested Objectives</b>
1. Understand career opportunities in the health science career cluster. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Research the occupational outlook for jobs in the health science career cluster.<ul style="list-style-type: none"><li>Career pathways</li><li>Education and training</li><li>Salaries</li><li>Aptitudes</li></ul></li></ol>
2. Identify the significance of the health science career cluster in society. <sup>DOK2</sup> <ol style="list-style-type: none"><li>Research the relationship of careers in health science to society and other careers.</li><li>Participate in a real-world job scenario associated with the health science career cluster.</li></ol>

- Career pathways
- Education and training
- Salaries
- Aptitudes

# Unit 11: Hospitality and Tourism

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Understand career opportunities in the hospitality and tourism career cluster. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the occupational outlook for jobs in the hospitality and tourism career cluster.<ul style="list-style-type: none"><li>• Career pathways</li><li>• Education and training</li><li>• Salaries</li><li>• Aptitudes</li></ul></li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Identify the significance of the hospitality and tourism career cluster in society. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the relationship of careers in hospitality and tourism to society and other careers.</li><li>b. Participate in a real-world job scenario associated with the hospitality and tourism career cluster.</li></ol></li></ol>

## Unit 12: Human Services

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Understand career opportunities in the human services career cluster. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the occupational outlook for jobs in the human services career cluster.<ul style="list-style-type: none"><li>• Career pathways</li><li>• Education and training</li><li>• Salaries</li><li>• Aptitudes</li></ul></li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Identify the significance of the human services career cluster in society. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the relationship of careers in human services to society and other careers.</li><li>b. Participate in a real-world job scenario associated with the human services career cluster.</li></ol></li></ol>

## Unit 13: Information Technology

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Understand career opportunities in the information technology career cluster. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the occupational outlook for jobs in the information technology career cluster.<ul style="list-style-type: none"><li>• Career pathways</li><li>• Education and training</li><li>• Salaries</li><li>• Aptitudes</li></ul></li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Identify the significance of the information technology career cluster in society. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the relationship of careers in information technology to society and other careers.</li><li>b. Participate in a real-world job scenario associated with the information technology career cluster.</li></ol></li></ol>

## Unit 14: Law, Public Safety, Corrections, and Security

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### Competencies and Suggested Objectives

1. Understand career opportunities in the law, public safety, corrections, and security career cluster. <sup>DOK2</sup>
  - a. Research the occupational outlook for jobs in the law, public safety, corrections, and security career cluster.
    - Career pathways
    - Education and training
    - Salaries
    - Aptitudes
2. Identify the significance of the law, public safety, corrections, and security career cluster in society. <sup>DOK2</sup>
  - a. Research the relationship of careers in law, public safety, corrections, and security to society and other careers.
  - b. Participate in a real-world job scenario associated with the law, public safety, corrections, and security career cluster.

## Unit 15: Manufacturing

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<b>Competencies and Suggested Objectives</b>
<ol style="list-style-type: none"><li>1. Understand career opportunities in the manufacturing career cluster. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the occupational outlook for jobs in the manufacturing career cluster.<ul style="list-style-type: none"><li>• Career pathways</li><li>• Education and training</li><li>• Salaries</li><li>• Aptitudes</li></ul></li></ol></li></ol>
<ol style="list-style-type: none"><li>2. Identify the significance of the manufacturing career cluster in society. <sup>DOK2</sup><ol style="list-style-type: none"><li>a. Research the relationship of careers in manufacturing to society and other careers.</li><li>b. Participate in a real-world job scenario associated with the manufacturing career cluster.</li></ol></li></ol>

## Unit 16: Marketing

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<b>Competencies and Suggested Objectives</b>
1. Understand career opportunities in the marketing career cluster. <sup>DOK2</sup> <ol style="list-style-type: none"><li>a. Research the occupational outlook for jobs in the marketing career cluster.<ul style="list-style-type: none"><li>• Career pathways</li><li>• Education and training</li><li>• Salaries</li><li>• Aptitudes</li></ul></li></ol>
2. Identify the significance of the marketing career cluster in society. <sup>DOK2</sup> <ol style="list-style-type: none"><li>a. Research the relationship of careers in marketing to society and other careers.</li><li>b. Participate in a real-world job scenario associated with the marketing career cluster.</li></ol>



# Unit 17: Science, Technology, Engineering and Math

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## **Competencies and Suggested Objectives**

1. Understand career opportunities in the science, technology, engineering and math career cluster. <sup>DOK2</sup>
  - a. Research the occupational outlook for jobs in the science, technology, engineering and math career cluster.
    - Career pathways
    - Education and training
    - Salaries
    - Aptitudes
2. Identify the significance of the science, technology, engineering and math career cluster in society. <sup>DOK2</sup>
  - a. Research the relationship of careers in science, technology, engineering and math to society and other careers.
  - b. Participate in a real-world job scenario associated with the science, technology, engineering and math career cluster.

## Unit 18: Transportation, Distribution and Logistics

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### Competencies and Suggested Objectives

1. Understand career opportunities in the transportation, distribution and logistics career cluster. <sup>DOK2</sup>
  - a. Research the occupational outlook for jobs in the transportation, distribution and logistics career cluster.
    - Career pathways
    - Education and training
    - Salaries
    - Aptitudes
2. Identify the significance of the transportation, distribution and logistics career cluster in society. <sup>DOK2</sup>
  - a. Research the relationship of careers in transportation, distribution and logistics to society and other careers.
  - b. Participate in a real-world job scenario associated with the transportation, distribution and logistics career cluster.

## Unit 19: Financial Literacy/Reality Fair

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<b>Competencies and Suggested Objectives</b>
<p>1. Understand how employment relates to the needs and functions of society. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Describe how the U.S. economy operates as a free-enterprise system.<ul style="list-style-type: none"><li>• Consumers</li><li>• Producers</li><li>• Supply and demand</li><li>• Competition</li></ul></li><li>b. Explain how the global economy affects individuals, communities, and our country.</li><li>c. Examine how socio-economic factors and technology affect employment trends.</li></ul>
<p>2. Create a personal budget. <sup>DOK3</sup></p> <ul style="list-style-type: none"><li>a. Identify reasons to keep track of spending habits.</li><li>b. Identify sources of income and expenses.</li><li>c. Explain the concept of “paying yourself first.”</li><li>d. Identify goals of saving.</li><li>e. Examine types of saving and investing.</li></ul>
<p>3. Research the options for the best credit for personal financial use. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>a. Examine the types and the cost of credit.<ul style="list-style-type: none"><li>• Student loans</li><li>• Credit cards</li><li>• Debit cards</li><li>• Mortgage loans</li><li>• Auto loans</li></ul></li><li>b. Compare the advantages and disadvantages of using credit.</li><li>c. Discover credit history and what actions affect credit reports.</li></ul>
<p>4. Understand the significance of debt. <sup>DOK1</sup></p> <ul style="list-style-type: none"><li>a. Identify the different types and causes of debt.</li><li>b. Identify ways to manage debt.<ul style="list-style-type: none"><li>• Budgeting</li><li>• Monitoring credit score</li></ul></li></ul>
<p>5. Demonstrate the proper use of financial documents and transactions. <sup>DOK2</sup></p> <ul style="list-style-type: none"><li>• Deposit slips</li><li>• Checks</li><li>• Debit card transaction</li><li>• Credit card transactions</li><li>• Bank statements</li><li>• Check registers</li></ul>

## Unit 20: College and Career Focus

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<b>Competencies and Suggested Objectives</b>
<p>1. Understand essential skills and techniques for employability. <sup>DOK2</sup></p> <ol style="list-style-type: none"><li>Identify soft and transferable skills essential for employment.</li><li>Demonstrate effective interview techniques and behavior.</li><li>Identify proper job application techniques.</li></ol>
<p>2. Explore local and national career opportunities. <sup>DOK1</sup></p> <ol style="list-style-type: none"><li>Utilize various sources to research career information.<ul style="list-style-type: none"><li>Career planning software</li><li>College planning tool</li><li>Government databases</li></ul></li><li>Discover essential career exploration information.<ul style="list-style-type: none"><li>Job responsibilities</li><li>Job skills</li><li>Education and training</li><li>Salary</li><li>Projected growth</li></ul></li><li>Evaluate work sites and/or participate in virtual field trips.</li></ol>
<p>3. Develop a five-year plan for high school, college and/or career. <sup>DOK3</sup></p> <ol style="list-style-type: none"><li>Determine goals related to desired career/profession.</li><li>Identify the program of study in necessary high school and college for desired career.<ul style="list-style-type: none"><li>Courses</li><li>Electives</li><li>Extracurricular activities</li></ul></li><li>Explore financial opportunities that assist with college costs.<ul style="list-style-type: none"><li>Financial aid programs</li><li>Scholarships</li></ul></li></ol>

# Student Competency Profile

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**Student 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, Course Introduction, and Ethics</b>		
	1.	Identify course expectations, district and school policies, and safety procedures related to the Keystone course.
	2.	Understand the importance of employability skills to be successful in the workplace.
	3.	Explore student organizations related to the sixteen national career clusters.
<b>Unit 2: Learning and Personality Styles</b>		
	1.	Discover learning and personality styles.
	2.	Develop characteristics of highly effective people.
<b>Unit 3: Agriculture, Food and Natural Resources</b>		
	1.	Understand career opportunities in the agriculture, food and natural resources career cluster.
	2.	Identify the significance of the agriculture, food and natural resources career cluster in society.
<b>Unit 4: Architecture and Construction</b>		
	1.	Understand career opportunities in the architecture and construction career cluster.
	2.	Identify the significance of the architecture and construction career cluster in society.
<b>Unit 5: Arts, A/V Technology and Communications</b>		
	1.	Understand career opportunities in the arts, audio/video technology and communications career cluster.
	2.	Identify the significance of the arts, audio/video technology and communications career cluster in society.
<b>Unit 6: Business Management and Administration</b>		
	1.	Understand career opportunities in the business management and administration career cluster.
	2.	Identify the significance of the business management and administration career cluster in society.

<b>Unit 7: Education and Training</b>		
	1.	Understand career opportunities in the education and training career cluster.
	2.	Identify the significance of the education and training career cluster in society.
<b>Unit 8: Finance</b>		
	1.	Understand career opportunities in the finance career cluster.
	2.	Identify the significance of the finance career cluster in society.
<b>Unit 9: Government and Public Administration</b>		
	1.	Understand career opportunities in the government and public administration career cluster.
	2.	Identify the significance of the government and public administration career cluster in society.
<b>Unit 10: Health Science</b>		
	1.	Understand career opportunities in the health science career cluster.
	2.	Identify the significance of the health science career cluster in society.
<b>Unit 11: Hospitality and Tourism</b>		
	1.	Understand career opportunities in the hospitality and tourism career cluster.
	2.	Identify the significance of the hospitality and tourism career cluster in society.
<b>Unit 12: Human Services</b>		
	1.	Understand career opportunities in the human services career cluster.
	2.	Identify the significance of the human services career cluster in society.
<b>Unit 13: Information Technology</b>		
	1.	Understand career opportunities in the information technology career cluster. <sup>DOK2</sup>
	2.	Identify the significance of the information technology career cluster in society.
<b>Unit 14: Law, Public Safety, Corrections, and Security</b>		
	1.	Understand career opportunities in the law, public safety, corrections, and security career cluster.
	2.	Identify the significance of the law, public safety, corrections, and security career cluster in society.
<b>Unit 15: Manufacturing</b>		
	1.	Understand career opportunities in the manufacturing career cluster
	2.	Identify the significance of the manufacturing career cluster in society
<b>Unit 16: Marketing</b>		
	1.	Understand career opportunities in the marketing career cluster.
	2.	Identify the significance of the marketing career cluster in society.

<b>Unit 17: Science, Technology, Engineering and Math</b>		
	1.	Understand career opportunities in the science, technology, engineering and math career cluster.
	2.	Identify the significance of the science, technology, engineering and math career cluster in society.
<b>Unit 18: Transportation, Distribution and Logistics</b>		
	1.	Understand career opportunities in the transportation, distribution and logistics career cluster.
	2.	Identify the significance of the transportation, distribution and logistics career cluster in society.
<b>Unit 19: Financial Literacy/Reality Fair</b>		
	1.	Understand how employment relates to the needs and functions of society.
	2.	Create a personal budget.
	3.	Research the options for the best credit for personal financial use.
	4.	Understand the significance of debt.
	5.	Demonstrate the proper use of financial documents and transactions.
<b>Unit 20: College and Career Focus</b>		
	1.	Understand essential skills and techniques for employability.
	2.	Explore local and national career opportunities.
	3.	Develop a five-year plan for high school, college and/or career.

# Appendix A: 21st Century Skills<sup>1</sup>

	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21 <sup>st</sup> Century Standards																					
CS1		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CS2							x		x							x					x
CS3		x	x						x				x		x						
CS4				x							x		x								
CS5		x		x	x											x		x	x		
CS6						x												x			
CS7			x																		x
CS8		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS9				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS10				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS11				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS12		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS13			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS14		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS15		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CS16		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

## CSS1-21st Century Themes

### CS1 Global Awareness

1. Using 21st century skills to understand and address global issues
2. Learning from and working collaboratively with individuals representing diverse cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
3. Understanding other nations and cultures, including the use of non-English languages

### CS2 Financial, Economic, Business, and Entrepreneurial Literacy

1. Knowing how to make appropriate personal economic choices
2. Understanding the role of the economy in society
3. Using entrepreneurial skills to enhance workplace productivity and career options

### CS3 Civic Literacy

1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
2. Exercising the rights and obligations of citizenship at local, state, national, and global levels
3. Understanding the local and global implications of civic decisions

### CS4 Health Literacy

1. Obtaining, interpreting, and understanding basic health information and services and using such information and services in ways that enhance health
2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance, and stress reduction
3. Using available information to make appropriate health-related decisions
4. Establishing and monitoring personal and family health goals
5. Understanding national and international public health and safety issues

<sup>1</sup>21st century skills. (n.d.). Washington, DC: Partnership for 21st Century Skills.



**CS5 Environmental Literacy**

1. Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water, and ecosystems.
2. Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.).
3. Investigate and analyze environmental issues, and make accurate conclusions about effective solutions.
4. Take individual and collective action toward addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues).

CSS2-Learning and Innovation Skills

**CS6 Creativity and Innovation**

1. Think Creatively
2. Work Creatively with Others
3. Implement Innovations

**CS7 Critical Thinking and Problem Solving**

1. Reason Effectively
2. Use Systems Thinking
3. Make Judgments and Decisions
4. Solve Problems

**CS8 Communication and Collaboration**

1. Communicate Clearly
2. Collaborate with Others

CSS3-Information, Media and Technology Skills

**CS9 Information Literacy**

1. Access and Evaluate Information
2. Use and Manage Information

**CS10 Media Literacy**

1. Analyze Media
2. Create Media Products

**CS11 ICT Literacy**

1. Apply Technology Effectively

CSS4-Life and Career Skills

**CS12 Flexibility and Adaptability**

1. Adapt to change
2. Be Flexible

**CS13 Initiative and Self-Direction**

1. Manage Goals and Time
2. Work Independently
3. Be Self-directed Learners

**CS14 Social and Cross-Cultural Skills**

1. Interact Effectively with others
2. Work Effectively in Diverse Teams

**CS15 Productivity and Accountability**

1. Manage Projects
2. Produce Results

**CS16 Leadership and Responsibility**

1. Guide and Lead Others
2. Be Responsible to Others