

2007 Mississippi Curriculum Framework

Postsecondary Agricultural Mechanics Technology

(Program CIP: 01.0201 – Agricultural Mechanics and Equipment/Machine Technology)

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Standards in this document are based on information from the following organizations:

Standards for Mississippi Postsecondary Agricultural Mechanics Technology Programs

Standards for Agricultural Equipment Technicians were adapted from the John Deere Ag Tech Competency list, published by Deere and Company, Moline, IL.

Related Academic Standards

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Preface

Postsecondary Agricultural Mechanics Technology Research Synopsis

Articles, books, Web sites, and other materials listed at the end of each course were considered during the revision process. These references are suggested for use by instructors and students during the study of the topics outlined.

Industry advisory team members from community colleges throughout the state were asked to give input related to changes to be made to the curriculum framework. Standards for the John Deere Ag Tech program, a nationally recognized curriculum for training agricultural equipment technicians, were reviewed to insure that students were receiving instruction on current equipment and technology in the field of agriculture.

Instructors from community colleges and their craft committee members throughout the state were also asked to give input on changes to be made to the curriculum framework.

Curriculum

The following national standards were referenced in each course of the curriculum:

- CTB/McGraw-Hill LLC *Tests of Adult Basic Education, Forms 7 and 8* Academic Standards
- *21st Century Skills*
- Competencies for Agricultural Equipment Technicians as published by Deere and Company

Industry and instructor comments, along with current research, were considered by the curriculum revision team during the revision process; changes were made as needed and appropriate. Many of the skills and topics noted in the research were already included in the curriculum framework. Specific changes made to the curriculum at the October 26-27, 2006, curriculum revision meeting included:

- Competencies and objectives were reviewed to ensure accuracy and appropriateness.
- Suggested references including textbooks, video and PowerPoint presentations, Web sites, and technical journals and magazines were added to each course.
- Specific additions or deletions included:
 - Competencies on basic electronic principles and switches and actuators were added to AMT 1213 Basic Electrical/Electronic Systems.
 - A competency on the use of microprocessors and other electronic devices was added to AMT 1223 Advanced Electrical/Electronic Systems.
 - A competency on hydrostatic transmissions was added to AMT 1323 Advanced Power Trains.
 - The course AMT 1713 Agricultural Equipment Repair was found to be repetitive of other courses and was deleted from the curriculum.
 - The course AMT 2313 was changed to AMT 2311 Cotton Harvesting Equipment and reduced from a 2 hour lecture, 2 hour lab course to a 2 hour lab.
 - A competency on different types of hay harvesting equipment was added to AMT 2413 Hay Harvesting Equipment.
- The Recommended Tools and Equipment list was updated.

Assessment

Students will be assessed using the *Postsecondary Agricultural Mechanics Technology MS-CPAS2 Test*.

Professional Learning

It is suggested that instructors participate in professional learning related to the following concepts:

- Setup, adjustment, use, and maintenance of precision agriculture technology equipment
- Setup, adjustment, use, and maintenance of microprocessor controls and monitors
- Use of the Mississippi Agriculture Education B.R.I.D.G.E. site on Blackboard®
- Differentiated instruction – To learn more about differentiated instruction, please go to http://www.paec.org/teacher2teacher/additional_subjects.html and click on Differentiated Instruction. Work through this online course and review the additional resources.

Foreword

As the world economy continues to evolve, businesses and industries must adopt new practices and processes in order to survive. Quality and cost control, work teams and participatory management, and an infusion of technology are transforming the way people work and do business. Employees are now expected to read, write, and communicate effectively; think creatively, solve problems, and make decisions; and interact with each other and the technologies in the workplace. Vocational-technical programs must also adopt these practices in order to provide graduates who can enter and advance in the changing work world.

The curriculum framework in this document reflects these changes in the workplace and a number of other factors that impact on local vocational-technical programs. Federal and state legislation calls for articulation between high school and community college programs, integration of academic and vocational skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment. National skills standards, developed by industry groups and sponsored by the U.S. Department of Education and Labor, provide vocational educators with the expectations of employers across the United States. All of these factors are reflected in the framework found in this document.

Referenced throughout the courses of the curriculum are the 21st Century Skills, which were developed by the Partnership for 21st Century Skills, a group of business and education organizations concerned about the gap between the knowledge and skills learned in school and those needed in communities and the workplace. A portion of the 21st Century Skills addresses learning skills needed in the 21st century, including information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. The need for these types of skills has been recognized for some time and the 21st Century Skills are adapted in part from the 1991 report from the U.S. Secretary of Labor's Commission on Achieving Necessary Skills (SCANS). Another important aspect of learning and working in the 21st century involves technology skills, and the International Society for Technology in Education, developers of the National Educational Technology Standards (NETS), were strategic partners in the Partnership for 21st Century Skills.

Each postsecondary program of instruction consists of a program description and a suggested sequence of courses which focus on the development of occupational competencies. Each vocational-technical course in this sequence has been written using a common format which includes the following components:

- Course Name – A common name that will be used by all community/junior colleges in reporting students.
- Course Abbreviation – A common abbreviation that will be used by all community/junior colleges in reporting students.

- Classification – Courses may be classified as:
 - Vocational-technical core – A required vocational-technical course for all students.
 - Area of concentration (AOC) core – A course required in an area of concentration of a cluster of programs.
 - Vocational-technical elective – An elective vocational-technical course.
 - Related academic course – An academic course which provides academic skills and knowledge directly related to the program area.
 - Academic core – An academic course which is required as part of the requirements for an Associate degree.
- Description – A short narrative which includes the major purpose(s) of the course and the recommended number of hours of lecture and laboratory activities to be conducted each week during a regular semester.
- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course.
- Corequisites – A listing of courses that may be taken while enrolled in the course.
- Competencies and Suggested Objectives – A listing of the competencies (major concepts and performances) and of the suggested student objectives that will enable students to demonstrate mastery of these competencies.

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75 percent of the time allocated to each course. The remaining 25 percent of each course should be developed at the local district level and may reflect:
 - Additional competencies and objectives within the course related to topics not found in the State framework, including activities related to specific needs of industries in the community college district.
 - Activities which develop a higher level of mastery on the existing competencies and suggested objectives.
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed/revised.
 - Activities which implement components of the Mississippi Tech Prep initiative, including integration of academic and vocational-technical skills and coursework, school-to-work transition activities, and articulation of secondary and postsecondary vocational-technical programs.
 - Individualized learning activities, including worksite learning activities, to better prepare individuals in the courses for their chosen occupational area.

- Sequencing of the course within a program is left to the discretion of the local district. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors.
- Programs that offer an Associate of Applied Science degree must include a minimum 15 semester credit hour academic core. Specific courses to be taken within this core are to be determined by the local district. Minimum academic core courses are as follows:
 - 3 semester credit hours Math/Science Elective
 - 3 semester credit hours Written Communications Elective
 - 3 semester credit hours Oral Communications Elective
 - 3 semester credit hours Humanities/Fine Arts Elective
 - 3 semester credit hours Social/Behavioral Science Elective

It is recommended that courses in the academic core be spaced out over the entire length of the program, so that students complete some academic and vocational-technical courses each semester. Each community/junior college has the discretion to select the actual courses that are required to meet this academic core requirement.

- In instances where secondary programs are directly related to community and junior college programs, competencies and suggested objectives from the high school programs are listed as Baseline Competencies. These competencies and objectives reflect skills and knowledge that are directly related to the community and junior college vocational-technical program. In adopting the curriculum framework, each community and junior college is asked to give assurances that:
 - Students who can demonstrate mastery of the Baseline Competencies do not receive duplicate instruction, and
 - Students who cannot demonstrate mastery of this content will be given the opportunity to do so.
- The roles of the Baseline Competencies are to:
 - Assist community/junior college personnel in developing articulation agreements with high schools, and
 - Ensure that all community and junior college courses provide a higher level of instruction than their secondary counterparts.
- The Baseline Competencies may be taught as special “Introduction” courses for 3-6 semester hours of institutional credit which will not count toward Associate degree requirements. Community and junior colleges may choose to integrate the Baseline Competencies into ongoing courses in lieu of offering the “Introduction” courses or may offer the competencies through special projects or individualized instruction methods.
- Technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

In order to provide flexibility within the districts, individual courses within a framework may be customized by:

- Adding new competencies and suggested objectives.
- Revising or extending the suggested objectives for individual competencies.
- Integrating baseline competencies from associated high school programs.
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the State Board for Community and Junior Colleges [SBCJC] of the change).

In addition, the curriculum framework as a whole may be customized by:

- Resequencing courses within the suggested course sequence.
- Developing and adding a new course which meets specific needs of industries and other clients in the community or junior college district (with SBCJC approval).
- Utilizing the technical elective options in many of the curricula to customize programs.

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Program Description

Agricultural Mechanics Technology is an instructional program that prepares individuals to select, operate, maintain, service, and use agricultural/industrial power units, machinery, and equipment. Included is instruction in engine design, use, maintenance, and repair techniques. The program covers internal combustion engines service and overhaul, electrical systems, hydraulic systems, power trains, air conditioning, grain harvesting equipment, spray equipment, row crop planting systems, cotton harvesting equipment, hay harvesting equipment, compact engines equipment, servicing, cutting and welding, and service repair center management and operations.

Graduates of the first year program shall be issued a Certificate of Agricultural Mechanics and those who complete the second year shall be awarded an Associate of Applied Science Degree in Agricultural Mechanics Technology. Graduates of this program are employed by agricultural equipment dealers, industrial, rental, and retail concerns, and agricultural businesses.

PROGRAM REQUIREMENTS

Agricultural Mechanics Technology is an articulated technical program designed to provide students with technical skills. Entry into the program is based upon mastery of skills which are taught in secondary Agriculture Power and Machinery programs. Students who do not possess such skills must complete additional course work in order to graduate from the program. The technical program consists of baseline competencies skills which may be obtained in a secondary program or at the community/junior college and technical skills and academics which must be obtained at the community/junior college level.

The curriculum for Agricultural Mechanics Technology is based upon data as collected from curricula guides, input from the business, national standards, and a revision team. The listing of tasks within these documents served as baseline data for the development of this curriculum. The task list used in this curriculum is based upon the following assumptions:

1. In all areas, appropriate theory, safety, and support instruction will be provided for each task. It is essential that all instruction has included use of the appropriate equipment needed to accomplish certain tasks. It is also assumed that each student has received instruction to locate and use current reference materials from publications which present manufacturers' recommended or required specifications and procedures for doing the various tasks.
2. The individual program should have written and detailed evaluation standards for each task covered in the curriculum. Learning progress of students should be monitored and evaluated against these stated standards. A system should be in place which informs all students of their progress throughout the program.
3. It is recognized that individual courses will differ across the technical programs. The development of appropriate learning activities and tests will be the responsibility of the individual program.
4. These standards require that tasks contained in the list be included in the program to validate that the program is meeting the needs of the business.

The curriculum for Agricultural Mechanics Technology is designed to serve as the core curriculum for approximately 75 percent of each course at the postsecondary level. The remaining 25 percent of each course is to be added at the local level based upon needs of students and area employers.

The technical program in Agricultural Mechanics Technology requires a minimum of 67 semester credit hours (sch) beyond the baseline competencies. Fifteen semester credit hours of academic core courses are included in this minimum. A certificate in Agricultural Mechanics may be awarded upon the satisfactory completion of 34 semester credit hours (sch) beyond the baseline competencies.

Industry standards referenced are adapted from the *Ag Tech* program as published by Deere and Company, Moline, IL. *Ag Tech* is a nationally recognized training program for farm power and machinery technicians.

Suggested Course Sequence*

Agricultural Mechanics Certificate

Baseline Competencies for Agricultural Mechanics Technology**

FIRST YEAR

3 sch Agricultural Mechanics Fundamentals (AMT 1123) 3 sch Basic Engines (AMT 1413) 3 sch Basic Electrical/Electronics Systems (AMT 1213) 3 sch Basic Power Trains (AMT 1313) 3 sch Compact Engines and Equipment (AMT 2813) 3 sch Technical Electives*** <hr style="width: 20%; margin-left: 0;"/> 18 sch	3 sch Advanced Engines (AMT 1423) 3 sch Advanced Electrical/Electronics Systems (AMT 1223) 1 sch Principles of Air Conditioning (AMT 1511) 3 sch Basic Hydraulic Systems (AMT 1613) 6 sch Technical Electives*** <hr style="width: 20%; margin-left: 0;"/> 16 sch
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* Students who lack entry level skills in math, English, science, etc. will be provided related studies.

** Baseline competencies are taken from the high school Agriculture Power and Machinery program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES***

Agricultural Equipment Repair (AMT 1713)
 Agricultural Records (AGT 1613)
 Applied Soils-Conservation and Use (AGT 1714)
 Cotton Harvesting Equipment (AMT 2311)
 Fundamentals of Microcomputer Applications (CPT 1113)
 Hay Harvesting Equipment (AMT 2413)
 Principles of Agricultural Management (AGT 1413)
 Principles of Agricultural Marketing (AGT 1513)
 Row Crop Planting Systems (AMT 2712)
 Special Problem in Agricultural Mechanics Technology [(AMT 291(1-3))]
 Spray Equipment (AMT 2513)
 Supervised Work Experience in Agricultural Mechanics Technology [AMT 292(1-6)]
 Work-Based Learning I, II, III, IV, V, and VI [WBL 191(1-3), WBL 192(1-3),
 WBL 193(1-3), WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)]

Note: Supervised Work Experience in Agricultural Mechanics Technology may take place in the community college facilities and/or with area farmers or agricultural mechanics businesses. This course may be scheduled during any semester or summer term.

Suggested Course Sequence*

Agricultural Mechanics Technology

Baseline Competencies for Agricultural Mechanics Technology**

FIRST YEAR

3 sch Agricultural Mechanics Fundamentals (AMT 1123) 3 sch Basic Engines (AMT 1413) 3 sch Basic Electrical/Electronics Systems (AMT 1213) 3 sch Basic Power Trains (AMT 1313) 3 sch Computer Elective+ 3 sch Written Communications Elective <hr style="width: 10%; margin-left: 0;"/> 18 sch	3 sch Advanced Engines (AMT 1423) 3 sch Advanced Electrical/Electronic Systems (AMT 1223) 3 sch Basic Hydraulic Systems (AMT 1613) 3 sch Advanced Power Trains (AMT 1323) 3 sch Math/Science Elective 3 sch Technical Electives*** <hr style="width: 10%; margin-left: 0;"/> 18 sch
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+ CPT 1113 Fundamentals of Microcomputer Applications, CSC 1113 Introduction to Computer Concepts, or ATE 1113 Science and Technology

SECOND YEAR

3 sch Grain Harvesting Equipment (AMT 2113) 3 sch Compact Engines and Equipment (AMT 2813) 1 sch Principles of Air Conditioning (AMT 1511) 3 sch Humanities/Fine Arts Elective 3 sch Oral Communications Elective 3 sch Technical Elective*** <hr style="width: 10%; margin-left: 0;"/> 16 sch	3 sch Row Crop Planting Systems (AMT 2712) 3 sch Spray Equipment (AMT 2513) 3 sch Advanced Hydraulic Systems (AMT 2623) 3 sch Social/Behavioral Science Elective 3 sch Technical Elective*** <hr style="width: 10%; margin-left: 0;"/> 15 sch
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* Students who lack entry-level skills in math, English, science, etc. will be provided related studies.

** Baseline competencies are taken from the high school Agriculture Power and Machinery program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES***

Agricultural Equipment Repair (AMT 1713)

Agricultural Records (AGT 1613)
Applied Soils-Conservation and Use (AGT 1714)
Cotton Harvesting Equipment (AMT 2311)
Fundamentals of Microcomputer Applications (CPT 1113)
Hay Harvesting Equipment (AMT 2413)
Principles of Agricultural Management (AGT 1413)
Principles of Agricultural Marketing (AGT 1513)
Service Repair Center Management and Operations (AMT 2823)
Special Problem in Agricultural Mechanics Technology [(AMT 291(1-3))]
Supervised Work Experience in Agricultural Mechanics Technology [AMT 292(1-6)]
Work-Based Learning I, II, III, IV, V, and VI [WBL 191(1-3), WBL 192(1-3), WBL
193(1-3), WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)]

Note: Supervised Work Experience in Agricultural Mechanics Technology may take place in the community college facilities and/or with area farmers or agricultural mechanics businesses. This course may be scheduled during any semester or summer term.

Agricultural Mechanics Technology Courses

Course Name: Agricultural Mechanics Fundamentals

Course Abbreviation: AMT 1123

Classification: Vocational-Technical Core

Description: A study of safe practices and procedures used in Agricultural Mechanics. Included are personal and shop safety, safe use of tools and equipment, flammable materials and fire safety, disposal of hazardous materials, and a comprehensive safety exam. An introduction to agricultural mechanics occupations, the development of employability skills, the utilization of technical media, and the identification and use of fasteners and hardware identified in the agricultural mechanics industry. (3 sch: 2 hr. lecture 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives
1. Explain safety rules for shop activity. <ol style="list-style-type: none"> a. Demonstrate proper and safe use of tools in the shop. b. Demonstrate proper and safe use of test equipment. c. Demonstrate proper and safe use of lifting and support equipment. d. Demonstrate eye safety procedures.
2. Explain procedures for identifying, storing, and disposing of hazardous materials. <ol style="list-style-type: none"> a. Describe procedures for storage and disposal of flammable materials. b. Describe storage and disposal procedures for hazardous materials.
3. Explain the use of the Materials Safety Data Sheet (MSDS) form. <ol style="list-style-type: none"> a. Review an MSDS form to identify safe handling and disposal procedures for hazardous materials. b. Demonstrate procedures for posting and filing MSDS forms.
4. Explain procedures for applying fire safety in the agricultural mechanics shop. <ol style="list-style-type: none"> a. Identify location of fire fighting equipment. b. Identify classes of fires and associated equipment for each class. c. Identify exit locations in case of emergency. d. Ensure 100 percent pass rate on comprehensive safety exam.
5. Explain the requirements and working conditions for employment in the agricultural mechanics industry. <ol style="list-style-type: none"> a. Describe employment opportunities in the agricultural mechanics industry. b. Describe education and experience requirements for employment in the agricultural mechanics industry. c. Describe earning and working conditions in the agricultural mechanics industry. d. Describe employability skills necessary for employment in the agricultural mechanics industry. e. Complete a job application. f. Complete a personal résumé. g. Conduct a job interview.

- | |
|---|
| 6. Use technical media in agricultural mechanics. |
| a. Read and interpret technical manuals to obtain specifications and procedures for repair and maintenance of agricultural equipment. |
| b. Use parts manuals and electronic media to identify and procure correct parts for repair. |
| 7. Identify fasteners and hardware used in agricultural mechanics. |
| a. Identify units of measure in SAE and metric systems. |
| b. Identify special applications fasteners used in agricultural mechanics. |
| 8. Identify special tools and test instruments for use in agricultural mechanics. |
| a. Identify electronics test instruments. |
| b. Identify hydraulic test instruments. |
| c. Identify special tools used in agricultural mechanics. |

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Safety

Service Department Policies and Procedures

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)

- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS1 Global Awareness
- CS2 Financial, Economic, and Business Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

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Course Name: Basic Electrical/Electronics Systems

Course Abbreviation: AMT 1213

Classification: Vocational-Technical Core

Description: A study of electrical/electronic systems and repair as it relates to agricultural power machinery and equipment. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Explain the physical laws of electricity and magnetism. <ol style="list-style-type: none"> Identify the physical laws of electricity. Describe the physical laws of magnetism.
2.	Demonstrate procedures for the use of test equipment. <ol style="list-style-type: none"> Measure voltage. Measure current. Measure resistance.
3.	Demonstrate procedures to maintain and use storage batteries. <ol style="list-style-type: none"> Describe safety procedures for the storage battery. Test the storage battery for voltage and cranking amperage. Service the storage battery.
4.	Demonstrate procedures for use of electrical switches and actuators. <ol style="list-style-type: none"> Design a circuit using electrical switches. Design a circuit using actuators.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Electrical Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)

- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

Bell, J. (2007). *Modern diesel technology, electricity and electronics*. Florence, KY: Thompson Delmar.

John Deere Publishing. (2005). *Fundamentals of service: Electronic and electrical systems*. Moline, IL: Author.

Computer Software

Certified Fluid Power. (2001). *Full motion control training: Electrical [Computer software]*. Provo, UT: Author.

MAVCC. (2006). Diesel technology: Electrical and electronic systems, teacher CD-ROM [Computer software]. Stillwater, OK: Author.

Course Name: Advanced Electrical/Electronics Systems

Course Abbreviation: AMT 1223

Classification: Vocational-Technical Core

Description: An advanced study of electrical/electronic systems and repair as it relates to agricultural power machinery and equipment. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: Basic Electrical/Electronics Systems (AMT 1213)

Competencies and Suggested Objectives	
1.	Explain the functions of the components of the cranking and charging systems. <ol style="list-style-type: none"> Describe the function of the cranking system including starter, solenoid, and relay. Describe the functions of the charging system including alternator, regulator, and indicator gauges.
2.	Demonstrate troubleshooting procedures for the electrical system. <ol style="list-style-type: none"> Demonstrate ability to use digital multimeter. Use service specifications. Read and interpret electrical symbols and schematics. Make necessary wire and terminal repairs.
3.	Describe the use of microprocessors and other electronic devices in equipment electrical systems. <ol style="list-style-type: none"> Identify primary electronic devices used in controller circuits such as potentiometers, magnetic pickups, and variable resistors. Describe the basic functions of a controller circuit. Describe procedures and tools for diagnosis of electronic controllers and circuits.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Electrical Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)

Postsecondary Agricultural Mechanics Technology

- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

Bell, J. (2007). *Modern diesel technology, electricity and electronics*. Florence, KY: Thompson Delmar.

John Deere Publishing. (2005). *Fundamentals of service: Electronic and electrical systems*. Moline, IL: Author.

Computer Software

Certified Fluid Power. (2001). *Full motion control training: Electrical [Computer software.]* Provo, UT: Author.

MAVCC. (2006). Diesel technology: Electrical and electronic systems, teacher CD-ROM [Computer software]. Stillwater, OK: Author.

Course Name: Basic Power Trains

Course Abbreviation: AMT 1313

Classification: Vocational-Technical Core

Description: A study of machines and the principles upon which they operate in the transmission of power. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Demonstrate applications of the six basic machines used for transmitting power in agricultural equipment. <ol style="list-style-type: none"> Demonstrate mechanical advantage and applications of the lever. Demonstrate mechanical advantage and applications of the wheel and axle. Demonstrate mechanical advantage and applications of the pulley and belts. Demonstrate mechanical advantage and applications of the inclined plane. Demonstrate mechanical advantage and applications of the screw. Demonstrate mechanical advantage and applications of the wedge.
2.	Explain the elements of differential and axle assemblies. <ol style="list-style-type: none"> Identify parts associated with differential systems. Identify parts associated with axle systems.
3.	Explain methods of power transmission and braking. <ol style="list-style-type: none"> Demonstrate the transmission of power through direct drive. Demonstrate the transmission of power through pulleys and belts. Demonstrate the transmission of power through chains and sprockets. Demonstrate the transmission of power through gears and shafts. Demonstrate the transmission of power through electrically and/or hydraulically controlled systems.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Powertrains

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)

- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

John Deere Publishing. (2003). *Fundamentals of service: Belts and chains*. Moline, IL: Author.

John Deere Publishing. (2005). *Fundamentals of service: Power trains*. Moline, IL: Author.

Computer Software

MAVCC. (2004). Diesel technology: Drive trains, teacher CD-ROM [Computer software]. Stillwater, OK: Author.

Course Name: Advanced Power Trains

Course Abbreviation: AMT 1323

Classification: Vocational-Technical Core (Associate Degree)

Description: Advanced study of machines and the principles upon which they operate in the transmission of power. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: Basic Power Trains (AMT 1313)

Competencies and Suggested Objectives	
1.	Disassemble and reassemble clutch packs. <ol style="list-style-type: none"> Disassemble a clutch pack. Inspect clutch parts for wear and damage. Reassemble clutch pack.
2.	Repair and replace component parts of a machine including eccentrics, shafts, bearings, fasteners, springs, seals, and "O" rings. <ol style="list-style-type: none"> Disassemble machines to inspect component parts. Inspect component parts of a machine. Determine if component parts meet manufacturer's specifications. Reassemble machines according to manufacturer's specifications.
3.	Describe the operation and maintenance of hydrostatic power trains. <ol style="list-style-type: none"> Describe basic principles of hydrostatic power transmission. Identify benefits of hydrostatic transmission. Disassemble, inspect, and reassemble a hydrostatic transmission.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Hydraulics
Powertrains

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)

- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

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21st Century Skills

- CS1 Global Awareness
- CS2 Financial, Economic, and Business Literacy
- CS3 Civic Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

John Deere Publishing. (2003). *Fundamentals of service: Belts and chains*. Moline, IL: Author.

John Deere Publishing. (2005). *Fundamentals of service: Power trains*. Moline, IL: Author.

Computer Software

MAVCC. (2004). Diesel technology: Drive trains, teacher CD-ROM [CD ROM software]. Stillwater, OK: Author.

Course Name: Basic Engines

Course Abbreviation: AMT 1413

Classification: Vocational-Technical Core

Description: A study of the theory of operation disassembly/assembly, parts identification, service, and repair of gasoline engines used in compact equipment. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Explain the theory of operation of an internal combustion engine. <ol style="list-style-type: none"> a. Describe events which occur in each cycle of the four-stroke cycle engine. b. Describe the elements necessary for the operation of a four-stroke cycle engine.
2.	Explain the compression ratio. <ol style="list-style-type: none"> a. Identify the formula used to calculate a compression ratio. b. Calculate the compression ratio.
3.	Service the fuel system in internal combustion engines. <ol style="list-style-type: none"> a. Identify the components of the fuel system. b. Service a gasoline fuel system.
4.	Compare the ignition systems found in gasoline engines. <ol style="list-style-type: none"> a. Describe how the spark ignition system functions.
5.	Explain the function of the lubrication system. <ol style="list-style-type: none"> a. Identify the components of the lubrication system. b. Describe the function of the components of the lubrication system. c. Identify types of lubricants.
6.	Explain the function of the cooling system. <ol style="list-style-type: none"> a. Identify the components of the cooling system. b. Describe the function of the components of the cooling system. c. Identify types of coolants.
7.	Explain the function of the air intake system. <ol style="list-style-type: none"> a. Identify the components of the air intake system. b. Describe the function of the components of the air intake system. c. Identify types of filters.
8.	Explain the function of the exhaust system. <ol style="list-style-type: none"> a. Identify the components of the exhaust system. b. Describe the function of the components of the exhaust system.
9.	Disassemble and assemble an engine. <ol style="list-style-type: none"> a. Disassemble a gasoline engine. b. Identify engine parts. c. Analyze cause of engine failure. d. Inspect parts and determine wear or damage using precision measuring tools. e. Reassemble according to manufacturer's specifications.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Engines and Fuel Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

CS4 Information and Communication Skills

- CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

John Deere Publishing. (2004). *Compact equipment: Engines*. Moline, IL.: Author.

John Deere Publishing. (2000). *Fuels, lubricants, and coolants*. Moline, IL: Author.

John Deere Publishing. (2006). *Identification of parts failure*. Moline, IL: Author.

Computer Software

MAVCC. (2002). Diesel technology: Engines, teacher CD-ROM [Computer software]. Stillwater, OK: Author.

Course Name: Advanced Engines

Course Abbreviation: AMT 1423

Classification: Vocational-Technical Core

Description: A study of the theory of operation disassembly/assembly, parts identification, service, and repair of diesel engines. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: Basic Engines (AMT 1413)

Competencies and Suggested Objectives	
1.	Service the fuel system in internal combustion engines. <ol style="list-style-type: none"> Identify the components of the diesel fuel system. Service a diesel fuel system. Describe how the compression ignition system functions.
2.	Explain the function of the lubrication system. <ol style="list-style-type: none"> Identify the components of the lubrication system. Describe the function of the components of the lubrication system. Identify types of lubricants.
3.	Explain the function of the cooling system. <ol style="list-style-type: none"> Identify the components of the cooling system. Describe the function of the components of the cooling system.
4.	Explain the function of the air intake system. <ol style="list-style-type: none"> Identify the components of the air intake system. Describe the function of the components of the air intake system. Identify types of filters.
5.	Explain the function of the exhaust system. <ol style="list-style-type: none"> Identify the components of the exhaust system. Describe the function of the components of the exhaust system. Describe the function of a turbo charger.
6.	Disassemble and assemble an engine. <ol style="list-style-type: none"> Disassemble a diesel engine. Identify engine parts. Analyze cause of engine failure. Inspect parts and determine wear or damage using precision measuring tools. Reassemble according to manufacturer's specifications.

STANDARDS

Standards for Agricultural Mechanics Technology

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Engines and Fuel Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCESBooks

Barberi, D., Miller, R., & Kellum, M. (1998). *Diesel technology: Engines*. Stillwater, OK: MAVCC.

John Deere Publishing. (2000). *Fuels, lubricants, and coolants*. Moline, IL: Author.

John Deere Publishing. (2004). *Fundamentals of service: Engines*. Moline, IL: Author.

John Deere Publishing. (2006). *Identification of parts failure*. Moline, IL: Author.

Computer Software

MAVCC. (2002). *Diesel technology: Engines, teacher CD-ROM* [Computer software]. Stillwater, OK: Author.

MAVCC. (2006). *Diesel technology: Preventive maintenance, teacher CD-ROM* [Computer software]. Stillwater, OK: Author.

Course Name: Principles of Air Conditioning

Course Abbreviation: AMT 1511

Classification: Vocational-Technical Core

Description: Principles and service of air conditioning systems used on agricultural equipment.
(1 sch: 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1. Describe the principles of refrigeration.	<ul style="list-style-type: none"> a. Describe the properties of refrigerant. b. Describe an evaporator, condenser, compressor, expansion valve, and thermostat. c. Describe the requirements for environmentally approved refrigerants allowed under federal and state regulations, including licensing.
2. Perform preventative maintenance on air conditioning systems.	<ul style="list-style-type: none"> a. Clean an air conditioning system. b. Visually inspect components of an air conditioning system. c. Perform leak detection on an air conditioning system. d. Check refrigerant level.
3. Service an air conditioning system.	<ul style="list-style-type: none"> a. Recover refrigerant. b. Inspect component parts. c. Evacuate the air conditioning system. d. Recharge the air conditioning system. e. Recheck for leaks.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Mobile Heating, Ventilation, and Air Conditioning

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)

Postsecondary Agricultural Mechanics Technology

- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

John Deere Publishing. (2005). *Fundamentals of service: Air conditioning*. Moline, IL: Author.

Videos

Thomson Delmar Learning. (2000). *Understanding automotive air conditioning* [DVD-ROM]. Florence, KY: Author.

Thomson Delmar Learning. (2000). *How to diagnose automotive air conditioning problems* [DVD-ROM]. Florence, KY: Author.

Course Name: Basic Hydraulic Systems

Course Abbreviation: AMT 1613

Classification: Vocational-Technical Core

Description: Basic theory and application of hydraulic systems in agricultural machinery and equipment. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Explain the physical laws of hydraulics. <ol style="list-style-type: none"> Define kinetic energy. Define potential energy.
2.	Identify types of hydraulic pumps. <ol style="list-style-type: none"> Identify a constant displacement pump. Identify a variable displacement pump.
3.	Identify and describe the functions of hydraulic control valves. <ol style="list-style-type: none"> Identify the types of hydraulic valves. Describe the functions of hydraulic valves.
4.	Identify and describe the functions of hydraulic actuators. <ol style="list-style-type: none"> Identify types of hydraulic actuators. Describe the functions of hydraulic actuators.
5.	Explain the functions of hydraulic systems. <ol style="list-style-type: none"> Describe the function of an open center hydraulic system. Describe the function of a closed center hydraulic system. Read and interpret hydraulic schematics.

STANDARDS

Standards for Agricultural Mechanics Technology

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Hydraulics

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)

- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

- John Deere Publishing. (2006). *Fundamentals of service: Hydraulics*. Moline, IL: Author.
- MAVCC. (1994). *Hydraulics, teacher edition*. Stillwater, OK: Author.

Computer Software

- Certified Fluid Power. (2001). *Full motion control training: Hydraulics* [Computer software.] Provo, UT: Author.

Course Name: Grain Harvesting Equipment

Course Abbreviation: AMT 2113

Classification: Vocational-Technical Core (Associate Degree)

Description: Procedures for the inspection, adjustment, repair, and lubrication of grain harvesting equipment. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives
1. Identify safety procedures used on grain harvesting equipment. <ol style="list-style-type: none"> a. Identify safety procedures for using lifting and support equipment. b. Identify safety procedures for servicing moving parts.
2. Service a combine header. <ol style="list-style-type: none"> a. Check the sickle blades and repair or replace. b. Check the auger fingers and repair or replace. c. Check and adjust reel height. d. Check and adjust all related gears, chains, and bearings.
3. Service the combine cylinder and concave. <ol style="list-style-type: none"> a. Check the bearing and repair or replace. b. Check the spike teeth or rasp bars and repair or replace. c. Adjust cylinder to concave. d. Set cylinder rpm.
4. Service combine separators. <ol style="list-style-type: none"> a. Inspect and adjust cleaning shoe and sieves. b. Inspect and adjust cleaning fan. c. Inspect and adjust clean grain and tailing elevator.
5. Service hydraulic system, final drives, and engines as specified by the manufacturer. <ol style="list-style-type: none"> a. Inspect, check fluid levels, and change filter on hydraulic systems. b. Inspect and check fluid levels on final drives. c. Inspect, check fluid levels, and change filter and oil on engine.
6. Service combine fan system. <ol style="list-style-type: none"> a. Inspect fan for worn blades, bearings, and belts and replace as needed. b. Adjust fan speed to specifications.
7. Lubricate combine. <ol style="list-style-type: none"> a. Read and interpret manufacturer's service manual for maintenance schedule and locations for lubrication. b. Consult manufacturer's service manual for types of oils and lubricants for use on combines.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Harvesting Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

John Deere Publishing. (1991). *Fundamentals of machine operation: Combine*. Moline, IL: Author.

Course Name: Cotton Harvesting Equipment

Course Abbreviation: AMT 2311

Classification: Vocational-Technical Elective

Description: Functions, maintenance, and repair of cotton picker drums and support systems. (2 sch: 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Identify safety procedures used on cotton harvesting equipment. <ol style="list-style-type: none"> Identify safety procedures for using lifting and support equipment. Identify safety procedures for servicing moving parts. Inspect and adjust all shields, safety devices, and guards found on cotton harvesting equipment.
2.	Set up and adjust cotton harvesting equipment for field operation. <ol style="list-style-type: none"> Identify functions of the components of cotton harvesting equipment. Describe the flow of cotton from the header to the basket. Set up cotton picker for field operation. Adjust cotton picker for field operation according to manufacturer's specifications.
3.	Repair and lubricate cotton harvesting equipment. <ol style="list-style-type: none"> Inspect cotton harvesting equipment for wear or damage. Repair and lubricate cotton harvesting equipment according to manufacturer's specifications.

STANDARDS

Standards for Agricultural Mechanics Technology

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Harvesting Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)

- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Web Sites

Case International. (2006). *Cotton express cotton pickers*. Retrieved November 27, 2006, from <http://caseih.com/products/series.aspx?seriesid=2593&navid=105&RL=ENNA>

John Deere and Company. (2006). *Cotton harvesting equipment*. Retrieved November 27, 2006, from http://www.deere.com/en_US/ProductCatalog/FR/category/FR_CHARVESTING.html

Course Name: Hay Harvesting Equipment

Course Abbreviation: AMT 2413

Classification: Vocational-Technical Elective

Description: Procedures for inspection, adjustment, repair, and lubrication of hay harvesting equipment. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Identify safety procedures used on hay harvesting equipment. <ol style="list-style-type: none"> Identify safety procedures for using, lifting, and supporting equipment. Identify safety procedures for servicing moving parts. Inspect and adjust all shields, safety devices, and guards found on hay harvesting equipment.
2.	Identify and describe different types of equipment used in hay harvesting. <ol style="list-style-type: none"> Identify and describe the different types of mowers used in hay harvesting. Identify and describe the different types of rakes used in hay harvesting. Identify and describe the different types of balers used in hay harvesting.
3.	Set up and adjust hay equipment for field operation. <ol style="list-style-type: none"> Attach hay equipment for field operation. Set up for field operation. Adjust for field operation according to manufacturer's specifications.
4.	Inspect, service and repair hay equipment. <ol style="list-style-type: none"> Inspect hay equipment for wear or damage. Service and repair hay equipment according to manufacturer's specifications.

STANDARDS

Standards for Agricultural Mechanics Technology

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Harvesting Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)

- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

John Deere Publishing. (2004). *Fundamentals of machinery operation: Hay and forage harvesting*. Moline, IL: Author.

John Deere Publishing. (1993). *Fundamentals of machinery operation: Mowers and sprayers*. Moline, IL: Author.

Videos

Deere and Company. (1995). *Round baler belt repair and maintenance* [Videotape]. Moline, IL: Author.

Web Sites

Prism Business Media. (2006). *Hay and forage harvesting*. Retrieved October 26, 2006, from <http://hayandforage.com/>.

Course Name: Spray Equipment

Course Abbreviation: AMT 2513

Classification: Vocational-Technical Core (Associate Degree); Vocational-Technical Elective (Certificate)

Description: Selection, assembly, inspection, adjustment, calibration, and repair of spray equipment including safety procedures and environmental concerns. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Identify safety procedures used on spray equipment. <ol style="list-style-type: none"> Identify safety procedures for using lifting and support equipment. Identify safety procedures for servicing moving parts. Identify MSDS functions and sheet symbols.
2.	Service mechanical components of a sprayer. <ol style="list-style-type: none"> Identify mechanical components of a sprayer. Disassemble and assemble a pressure manifold. Disassemble and assemble a pump. Disassemble and assemble a valve. Disassemble and assemble a spray body.
3.	Explain procedures to calibrate a sprayer. <ol style="list-style-type: none"> Identify methods of calibration including distance method and time method. Calculate quantity of spray material to be applied. Select spray nozzles for various applications and environmental considerations. Calibrate a sprayer for a given application rate. Describe principles of operation of a variable rate spray applicator.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Tillage, Seeding, and Chemical Application Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
 R2 Words in Context (same and opposite meaning)

- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS1 Global Awareness
- CS2 Financial, Economic, and Business Literacy
- CS3 Civic Literacy
- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

Brase, T. (2006). *Precision agriculture*. Clifton Park, NY: Delmar.

John Deere Publishing. (1993). *Fundamentals of machinery operation: Mowers and sprayers*. Moline, IL: Author.

John Deere Publishing. (2003). *The precision-farming guide for agriculturists*. Moline, IL: Author.

Course Name: Advanced Hydraulic Systems

Course Abbreviation: AMT 2623

Classification: Vocational-Technical Core (Associate Degree)

Description: Advanced theory and application of hydraulic systems in agricultural machinery and equipment. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: Basic Hydraulic Systems (AMT 1613)

Competencies and Suggested Objectives	
1.	Perform service and tests on hydraulic systems. <ol style="list-style-type: none"> Pressure test an open center hydraulic system. Flow test an open center hydraulic system. Service an open center hydraulic system. Pressure test a closed center hydraulic system. Flow test a closed center hydraulic system. Service a closed center hydraulic system.
2.	Disassemble, repair, and reassemble radial piston pumps. <ol style="list-style-type: none"> Identify components of radial piston pumps. Inspect components of radial piston pumps for wear and damage. Reassemble radial piston pumps according to manufacturer's specifications.
3.	Disassemble, repair, and reassemble radial axial piston pumps. <ol style="list-style-type: none"> Identify components of radial axial piston pumps. Inspect radial axial piston pump components for wear and damage. Reassemble radial axial piston pumps according to manufacturer's specifications.
4.	Identify and service hydraulic control valve assemblies. <ol style="list-style-type: none"> Describe types and functions of hydraulic control valve assemblies. Disassemble, inspect, and reassemble hydraulic control valves.

STANDARDS

Standards for Agricultural Mechanics Technology

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Hydraulics

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
 R2 Words in Context (same and opposite meaning)

- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

- John Deere Publishing. (2006). *Fundamentals of service: Hydraulics*. Moline, IL: Author.
- John Deere Publishing. (1997). *Fundamentals of service: Hydraulic systems diagnostics*. Moline, IL: Author.
- MAVCC. (1994). *Hydraulics, teacher edition*. Stillwater, OK: Author.

Computer Software

Certified Fluid Power. (2001). Full motion control training: Hydraulics [Computer software.]
Provo, UT: Author.

Course Name: Row Crop Planting Systems

Course Abbreviation: AMT 2712

Classification: Vocational-Technical Core (Associate Degree); Vocational-Technical Elective (Certificate)

Description: Setup, inspection, adjustment, and service of row crop planting equipment including an introduction to variable rate application equipment. (2 sch: 1 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Demonstrate procedures to set up row crop planting equipment. <ol style="list-style-type: none"> Identify drive components on row crop planters. Identify covering components on row crop planters. Identify the metering devices on row crop planters. Set up planters for row width and crop. Describe use of no-till planting equipment. Set up no-till planting equipment. Describe use of transplanters. Set up transplanters.
2.	Demonstrate procedures to adjust row crop planting equipment. <ol style="list-style-type: none"> Identify adjustments on row crop planters. Describe adjustment of the metering devices on row crop planters. Perform adjustments on row crop planters. Calibrate fertilizer application equipment.
3.	Demonstrate procedures to service row crop planting equipment. <ol style="list-style-type: none"> Identify service to perform on row crop planters. Describe service of the metering devices on row crop planters. Perform service on row crop planters.
4.	Describe and discuss the principles of precision agriculture technology. <ol style="list-style-type: none"> Identify the components of a precision agriculture program. Discuss factors to be considered in establishing a variable rate prescription for a given crop and field.

STANDARDS

Standards for Agricultural Mechanics Technology

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Tillage, Seeding, and Chemical Application Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

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21st Century Skills

- CS1 Global Awareness
- CS2 Financial, Economic, and Business Literacy
- CS3 Civic Literacy

SUGGESTED REFERENCESBooks

Brase, T. (2006). *Precision agriculture*. Clifton Park, NY: Delmar.

John Deere Publishing. (2003). *The precision-farming guide for agriculturists*. Moline, IL: Author.

John Deere Publishing. (1998). *Fundamentals of service: Planting*. Moline, IL: Author.

Web Sites

Case/IH. (2006). *Planting and seeding equipment*. Retrieved December 5, 2006, from <http://www.caseih.com/products/line.aspx?lineid=22&RL=ENNA>.

Deere and Company. (2006). *Seed equipment and planting equipment from John Deere*. Retrieved December 5, 2006, from http://www.deere.com/en_US/ProductCatalog/FR/category/FR_PSED.html.

Course Name: Compact Engines and Equipment

Course Abbreviation: AMT 2813

Classification: Vocational-Technical Core

Description: Inspection, service, and repair of compact equipment. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1. Identify safety procedures used on compact equipment.	<ul style="list-style-type: none"> a. Identify safety procedures for using lifting and supporting compact equipment. b. Identify safety procedures for servicing moving parts. c. Inspect and adjust all shields, safety devices, and guards.
2. Service compact equipment.	<ul style="list-style-type: none"> a. Perform periodic maintenance on compact equipment. b. Troubleshoot, inspect, and repair compact equipment.
3. Troubleshoot and repair major component parts of compact equipment.	<ul style="list-style-type: none"> a. Inspect, troubleshoot, and repair/adjust pumps on compact equipment. b. Inspect, troubleshoot, and repair/adjust gear boxes on compact equipment. c. Inspect, troubleshoot, and repair/adjust mower decks. d. Inspect, troubleshoot, and repair/adjust PTO and belt drives.

STANDARDS

Standards for Agricultural Mechanics Technology

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Engines and Fuel Systems

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)

Postsecondary Agricultural Mechanics Technology

- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

- John Deere Publishing. (2004). *Compact equipment: Engines*. Moline, IL: Author.
- John Deere Publishing. (2004). *Compact equipment: Power trains*. Moline, IL: Author.
- MAVCC. (1996). *Power product: Engine systems and service*. Stillwater, OK: Author.
- MAVCC. (1999). *Power product: Equipment systems*. Stillwater, OK: Author.
- MAVCC. (1999). *Power product: Lawn and garden equipment*. Stillwater, OK: Author.

Computer Software

MAVCC. (2002). Diesel technology: Engines, teacher CD-ROM [Computer software].
Stillwater, OK: Author.

Course Name: Service Repair Center Management and Operations

Course Abbreviation: AMT 2823

Classification: Vocational-Technical Elective (Associate Degree)

Description: Management and daily operations of an agricultural equipment service center including recordkeeping, reference materials, tool and equipment maintenance, and service scheduling. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives	
1.	Maintain manual and computerized records. <ol style="list-style-type: none"> a. Utilize repair orders. b. Record time sheets. c. Prepare parts tickets.
2.	Manage shop tools, equipment, and facilities <ol style="list-style-type: none"> a. Demonstrate inventory of special tools using manual and computerized record systems. b. Demonstrate maintenance and storage procedures for tools and equipment.
3.	Maintain reference library, including technical media and computerized systems. <ol style="list-style-type: none"> a. Demonstrate inventory of reference library. b. Demonstrate procedures for keeping publications current. c. Demonstrate ability to locate information in the reference library. d. Demonstrate ability to locate information in the reference library using manual and computerized systems.
4.	Schedule service using manual and computerized systems. <ol style="list-style-type: none"> a. Demonstrate ability to prepare a service order. b. Demonstrate ability to identify services required. c. Plan repair jobs according to the time schedule published by the manufacturer.

STANDARDS

Standards for Agricultural Mechanics Technology

The following standards were adapted from *John Deere Ag Tech Competencies*, an educational program sponsored by Deere and Company that has been adopted by community colleges and technical institutes across the United States and Canada.

Service Department Policies and Procedures
Advanced Technology

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)

- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)
- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

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21st Century Skills

- CS4 Information and Communication Skills
- CS5 Thinking and Problem-Solving Skills
- CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

Books

- American Association for Vocational Instructional Materials. (2002). *Developing safety skills for the home and shop*. Winterville, GA: Author.
- Herren, R. (2006). *Agriculture mechanics: Fundamentals and applications* (5th ed.). Albany, NY: Delmar.

Schneider, M. (2004). *Automotive service management, the high performance shop*. Florence, KY: Thompson Delmar.

Computer Software

AERA Engine Rebuilder's Association. (2006). Pro-Sis [Computer software]. Buffalo Grove, IL: Author.

Course Name: Special Problem in Agricultural Mechanics Technology

Course Abbreviation: AMT 291(1-3)

Classification: Vocational-Technical Elective

Description: A course to provide students with an opportunity to utilize skills and knowledge gained in other Agricultural Mechanics Technology courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project. (1-3 sch: 2-6 hr. lab)

Prerequisite: Sophomore standing in Agricultural Mechanics Technology and/or consent of the instructor.

Competencies and Suggested Objectives	
1.	Develop a written plan which details the activities and projects to be completed. <ol style="list-style-type: none"> a. Use a written plan which details the activities and projects to be completed. b. Perform written occupational objectives in the special problem.
2.	Assess accomplishment of objectives. <ol style="list-style-type: none"> a. Prepare daily written assessments of accomplishment of objectives. b. Present weekly written reports to the instructor of activities performed and objectives accomplished.
3.	Use and follow a set of written guidelines for the special problem. <ol style="list-style-type: none"> a. Develop and follow a set of written guidelines for the special problem.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for use in this course will depend upon the nature of the problem under investigation.

Course Name: Supervised Work Experience in Agricultural Mechanics Technology

Course Abbreviation: AMT 292(1-6)

Classification: Vocational-Technical Elective

Description: A course which is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of one semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisite: Consent of instructor

Competencies and Suggested Objectives
1. Follow a set of instructor-written guidelines for the supervised work experience program.
2. Apply skills needed to be a viable member of the workforce. <ol style="list-style-type: none"> a. Prepare a description of skills to be developed in the supervised work experience program. b. Practice skills needed to be a viable member of the workforce.
3. Practice human relationship skills in the supervised work experience program.
4. Practice positive work habits, responsibilities, and ethics.
5. Develop written occupational objectives in the supervised work experience program.
6. Assess performance of occupational skills. <ol style="list-style-type: none"> a. Prepare daily written assessments of work performance as specified in the occupational objectives. b. Present weekly written reports to the instructor of activities performed and objectives accomplished.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for use in this course will depend upon the nature of the problem under investigation.

Course Name: Work-Based Learning I, II, III, IV, V, and VI

Course Abbreviation: WBL 191(1-3), WBL 192(1-3), WBL 193(1-3), WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)

Classification: Free Elective

Description: A structured work-site learning experience in which the student, program area teacher, Work-Based Learning Coordinator, and worksite supervisor/mentor develop and implement an educational training agreement. Designed to integrate the student's academic and technical skills into a work environment. May include regular meetings and seminars with school personnel and employers for supplemental instruction and progress reviews. (1-3 sch: 3-9 hours externship)

Prerequisite: Concurrent enrollment in vocational-technical program area courses

Competencies and Suggested Objectives	
1.	Apply technical skills and related academic knowledge needed to be a viable member of the workforce. <ol style="list-style-type: none"> a. Demonstrate technical skills necessary to complete job requirements. b. Demonstrate academic skills necessary to complete job requirements. c. Perform tasks detailed in an educational training agreement at the work setting.
2.	Apply general workplace skills to include positive work habits necessary for successful employment. <ol style="list-style-type: none"> a. Demonstrate appropriate human relationship skills in the work setting to include conflict resolution, team participation, leadership, negotiation, and customer/client service. b. Utilize time, materials, and resource management skills. c. Use critical thinking skills such as problem-solving, decision making, and reasoning. d. Acquire, evaluate, organize, maintain, interpret, and communicate information.

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for this course will depend upon the nature of the problem under investigation.

Recommended Tools and Equipment

(Quantities for a class up to 15 students)

CAPITALIZED ITEMS

1. Air Compressor (1)
2. Air Conditioning Charging and Recovery Unit (1)
3. Bandsaw, Metal (1)
4. Cabinet, Ultraviolet (with Safety Glasses) (1)
5. Cabinet, Flammable Storage (1)
6. Computers with printers (1 per student)
7. Drill Press (½" Chuck) (1)
8. Dynamometer, Diesel (1)
9. Engines, Diesel (3 Cylinder or Larger) (2)
10. Engines, Compact (Variety) (8)
11. Implement, PTO Driven (1)
12. Jacks, Floor (5 Ton) (2)
13. Machine, Valve Grinder (with Accessories) (1)
14. Meter, Flow with Adapter Kit (1)
15. Plasma Arc Cutter (with Accessories) (5/8" Capacity) (1)
16. Porta Power (with Accessories) (1)
17. Press, Hydraulic (25 Ton) (1)
18. Saw, Metal Cutoff (14") (1)
19. Stands, Diesel Engine (2)
20. System, Global Positioning Equipment with Accessories (1)
21. Tester, Compression with Adapters (Diesel) (1)
22. Tester, Hydraulic Pressure with Adapters (1)
23. Tester, Injection Nozzle (with Adapters) (1)
24. Tester, Hydraulic System (1)
25. Tractor, Diesel Powered (Current Technology) (1)
26. Trainer, Hydraulics (1)
27. Washer, Parts (1)
28. Washer, Pressure (Portable 3,500 PSI) (1)
29. Welder, TIG (Water Cooled with Accessories) (1)
30. Welder, Portable (AC/DC Generator) (1)
31. Welders, AC/DC (with Accessories) (Set) (5)
32. Welders, MIG (with Accessories) (2)

NON-CAPITALIZED ITEMS

1. Air Conditioning R-12 and R134A Gauge Set (1)
2. Air Conditioning Leak Detection Test Set (1)
3. Analyzer, Charging and Starting (1)
4. Anvil (150 lb.) (1)
5. Bar, Pry (Set) (1)

6. Benches, Work (Wood and Metal) (12)
7. Booster Pack, Portable (750 Cranking Amps) (1)
8. Calipers, Dial (2)
9. Can, Radiator Fill (1)
10. Cans, Fuel Storage (2)
11. Carts, Oxyfuel Cutting and Welding (2)
12. Charger, Battery (1)
13. Chisel, Cold (Set) (1)
14. Clamps, C (8") (10)
15. Clamps, Vise Grip (Set) (2)
16. Compressors, Ring (Small Engine) (2)
17. Compressor, Ring (Diesel) (1)
18. Compressors, Valve Spring (Small Engine) (2)
19. Compressor, Valve Spring (Diesel) (1)
20. Creepers (2)
21. Cutter, Valve Seat (Small Engine) (1)
22. Dial Indicators (2)
23. Drills, Portable Electric (1/2") (2)
24. Drill, Twist (Set 1/16"-1") (1)
25. Drills, Portable Electric (3/8") (2)
26. Files, Set (2)
27. Flare Tool, Tubing (1)
28. Gauge, Compression (Small Engine) (1)
29. Gauge, Compression (Diesel with adapters) (1)
30. Gauge, Telescoping (Set) (1)
31. Grinder, Portable (8") (1)
32. Grinder, Portable (5") (1)
33. Grinder, Bench (8") (1)
34. Guns, Paint (with Accessories) (2)
35. Gun, Grease (1)
36. Gun, Electric Soldering (1)
37. Hacksaws (4)
38. Hammer, Shop (8 lb.) (1)
39. Hammers, Ball Peen (Set) (4)
40. Hammers, Shop (3 lb.) (2)
41. Hoist, Shop (3 Ton or Larger) (1)
42. Holders, Flywheel (2)
43. Hone, Cylinder (Diesel) (1)
44. Hone, Cylinder (Small Engine) (1)
45. Hoses, Air Pressure (6)
46. Jack, Hydraulic Bottle (10 Ton) (1)
47. Jackstands (10 Ton) (6)
48. Jackstands (2 Ton) (6)
49. Jackstands (5 Ton) (6)
50. Levels (4') (2)
51. Mallets, Soft Face (4)

52. Micrometer, Outside (Set) (1)
53. Micrometer, Inside (Set) (1)
54. Multimeters, Digital (4)
55. Oxyfuel Cutting and Welding (with Accessories) (Set) (2)
56. Pliers, Set (Slipjoint, Needlenose, Adjustable Jaw, Diagonal Cutters, Lockring, and Snapping) (5)
57. Puller, Jaw (Set) (1)
58. Puller, Sleeve (1)
59. Punch, Metal (Set) (1)
60. Racks, Metal Storage (4)
61. Regulators, Air Compressor (2)
62. Sanders, Portable Pneumatic (2)
63. Sanders, Hand (3" x 5" pad) (5)
64. Sanders, Hand (4½" x 9" pad) (5)
65. Screwdriver, Phillips Sets (4)
66. Screwdriver, Flat Blade Sets (4)
67. Screwdriver, Torx (Set) (1)
68. Sharpener, Twist Drill (1)
69. Shields, Face (5)
70. Squares, L (2)
71. Tables, Welding Portable (2)
72. Tachometer, Hand Held (1)
73. Tank, Used Oil Storage (1)
74. Tap and Die Set (SAE) (1)
75. Tap and Die Set (Metric) (1)
76. Tape Measures (¾" x 25') (4)
77. Tape Measures (½" x 12') (10)
78. Tester, Battery (1)
79. Tester, Ignition System (Small Engine) (1)
80. Tester, Coolant System (1)
81. Testers, Circuit (2)
82. Tester, Spark (Small Engine) (1)
83. Tool, Engine Bearing (1)
84. Tool, Bearing Separator (Set) (1)
85. Tool, Bushing Driving (Set) (1)
86. Tool, Clutch Alignment (Set) (1)
87. Tool, Seal Driving (Set) (1)
88. Tool, Bearing Driving (Set) (1)
89. Tool, Bolt Extractor (Set) (1)
90. Vacuum, Shop (1)
91. Vise, Drill Press (1)
92. Vises (6") (4)
93. Wire Cutters (10)
94. Wrenches, Clutch (2)
95. Wrenches, Allen (Set SAE) (4)
96. Wrenches, Allen (Set Metric) (4)

97. Wrenches, Combination (Set ¼"-1¼" and Metric) (4)
98. Wrenches, Combination (Set 1¼"-2") (1)
99. Wrenches, Ignition (Set) (4)
100. Wrench, Line (Set) (1)
101. Wrench, Impact Socket Set (3/8" Drive SAE and Metric) (1)
102. Wrenches, Socket Set (¾" drive f"-2¼" Deep and Shallow and Metric Sizes) (4)
103. Wrenches, Torque (1/4" Drive SAE and Metric Inch/Pounds) (2)
104. Wrenches, Torque (½" Drive SAE and Metric Foot/Pounds, 25 to 250 ft./lbs.) (2)
105. Wrench, Pneumatic Ratchet (3/8" Drive) (1)
106. Wrench, Impact Pneumatic (½" Drive) (1)
107. Wrench, Impact Socket Set (½" Drive SAE and Metric) (1)
108. Wrenches, Socket Set (¼" drive ¼"-½" Deep and Shallow and Metric Sizes) (4)
109. Wrenches, Socket Set (3/8" drive ¼"-f" Deep and Shallow and Metric Sizes) (4)
110. Wrenches, Socket Set (½" drive d"-1¼" Deep and Shallow and Metric Sizes) (4)
111. Wrenches, Pipe (Set 8"-24") (1)

RECOMMENDED INSTRUCTIONAL AIDS

It is recommended that instructors have access to the following items:

1. Microcomputer integrated software package (word processing, spreadsheet, and database)
2. LCD video projector
3. VCR/DVD player
4. TV monitor
5. Digital camera
6. Smartboard
7. Overhead projector
8. Notebook computer

ASSESSMENT

BLUEPRINT

This program is assessed using the MS-CPAS. The following blueprint summary contains the competencies that are measured when assessing this program. Competencies are grouped into *clusters* and a weight is given to each cluster to determine the number of items needed from each cluster. The numbers of C1s and C2s (item difficulty levels) are also indicated on the blueprint.

Title of Program & Code: Agricultural Mechanics Technology Program Level: Postsecondary

Cluster/Competency	Level 1 (C1)	Level 2 (C2)	TOTAL	%
	Number	Number		
Cluster 1: Fundamentals AMT 1123 Agricultural Mechanics Fundamentals	4	2	5	14%
Cluster 2: Engines AMT 1413 Basic Engines AMT 1423 Advanced Engines AMT 2813 Compact Engines and Equipment	8	4	12	35%
Cluster 3: Electronics/Electrical AMT 1213 Basic Electrical/Electronic Systems AMT 1223 Advanced Electrical/Electronic Systems	5	3	8	23%
Cluster 4: Hydraulics and Air Conditioning AMT 1613 Basic Hydraulic Systems AMT 1511 Principles of Air Conditioning	5	1	5	14%
Cluster 5: Power Trains AMT 1313 Basic Power Trains	4	1	5	14%
Total Questions:	26	9	35	

Baseline Competencies

The following competencies and suggested objectives are taken from the publication *Mississippi Curriculum Framework for Agriculture Power and Machinery*. These competencies and objectives represent the baseline which was used to develop the community/junior college Agricultural Mechanics Technology courses. Students enrolled in postsecondary courses should either (1) have documented mastery of these competencies, or (2) be provided with these competencies before studying the advanced competencies in the Agricultural Mechanics Technology program.

Baseline competencies may be integrated into existing courses in the curriculum or taught as special “Introduction” courses. The “Introduction” courses may be taught for up to six semester hours of institutional credit and may be divided into two courses. If the Baseline Competencies are to be taught as “Introduction” courses, each course should be at least 3 credit hours. The following course number(s) and description should be used:

Course Name(s): Introduction to Agricultural Mechanics Technology, Introduction to Agricultural Mechanics Technology I, or Introduction to Agricultural Mechanics Technology II

Course Abbreviation(s): AMT 100(3-6), AMT 1013, AMT 1023

Classification: Vocational-Technical Core

Description: These courses contain the baseline competencies and suggested objectives from the high school curriculum in Agriculture Power and Machinery which directly relate to the community college Agricultural Mechanics program. The courses are designed for students entering the community college who have had no previous training or documented experience in the field. (3-6 semester hours based upon existing skills for each student, may be divided into 2 courses for a maximum total of 6 hours of institutional credit.)

Competencies and Suggested Objectives:

1. Explain the requirements and working conditions for employment in the Agriculture Power and Machinery industry.
 - a. Describe employment opportunities in the Agriculture Power and Machinery industry.
 - b. Describe education and experience requirements for employment in the Agriculture Power and Machinery industry.
 - c. Describe earning and working conditions in the Agriculture Power and Machinery industry.
 - d. Describe employability skills necessary for employment in the Agriculture Power and Machinery industry.
 - e. Complete a job application.
 - f. Complete a personal resume.
 - g. Conduct a job interview.

2. Explain the general laboratory safety requirements for Agriculture Power and Machinery.
 - a. Describe personal safety rules for working in the laboratory and/or Agriculture Power and Machinery industry, including the eye safety law.
 - b. Describe general workplace safety rules.
 - c. Describe the proper use of fire extinguishers and classes of fires.
 - d. Identify standard industry Safety Color Code.
 - e. Describe procedures for safely handling heavy objects.
 - f. Identify safety precautions and devices associated with the use of electricity.
 - g. Describe accident reporting procedures.
3. Identify hazardous materials that may be found in the laboratory or on a job site and describe procedures for handling/avoidance or removal of materials.
 - a. Review MSDS sheet to identify hazardous materials.
 - b. Describe the approved storage procedures for flammable materials found in the Agriculture Power and Machinery laboratory.
 - c. Describe approved procedures for disposal of hazardous materials.
 - d. Demonstrate safe procedures for the use of storage batteries.
4. Demonstrate use of hand tools used in Agriculture Power and Machinery.
 - a. Identify basic hand tools used in Agriculture Power and Machinery (wrenches, sockets and accessories, screwdrivers, pliers, hammers, punches and chisels, etc.)
 - b. Demonstrate use of hand tools used in Agriculture Power and Machinery.
5. Demonstrate use of portable power tools found in the Agriculture Power and Machinery laboratory.
 - a. Identify types of portable power tools used in Agriculture Power and Machinery (grinders, drills/drivers, impact wrenches, saws, and presses, etc).
 - b. Demonstrate safety procedures for use of portable power tools used in Agriculture Power and Machinery.
 - c. Demonstrate the use of portable power tools used in the Agriculture Power and Machinery laboratory.
6. Demonstrate the use of stationary tools used in Agriculture Power and Machinery.
 - a. Identify stationary tools used in the Agriculture Power and Machinery laboratory (band saws, drill presses, hydraulic shears, pedestal/bench grinders, abrasive cut-off saws, etc.
 - b. Describe the functions of stationary power tools used in Agriculture Power and Machinery.
 - c. Describe safety rules of stationary power tools used in Agriculture Power and Machinery.
 - d. Demonstrate use of each stationary power tool used in Agriculture Power and Machinery.
 - e. Perform maintenance procedures on each stationary power tool used in Agriculture Power and Machinery.
7. Demonstrate use of lifting, hoisting, and supporting equipment used in Agriculture Power and Machinery.
 - a. Identify lifting, hoisting, and supporting equipment used in Agriculture Power and Machinery (jacks, jack stands, hoists, floor cranes, overhead cranes, chains and slings, etc.).
 - b. Demonstrate safety rules for using lifting, hoisting, and supporting equipment in Agriculture Power and Machinery.
 - c. Demonstrate use of lifting, hoisting, and supporting equipment in Agriculture Power and Machinery.

8. Identify types of measuring devices used in Agriculture Power and Machinery.
 - a. Identify types of measuring devices used in Agriculture Power and Machinery, including tape measure, rules, micrometers, calipers, dial indicators, and thickness gauges.
 - b. Demonstrate ability to use types of measuring devices used in Agriculture Power and Machinery, including tape measures, rules, micrometers, calipers, dial indicators, and thickness gauges.
9. Apply English and metric systems of measurement.
 - a. Describe English and metric units for measuring distance, area, weight, and volume.
 - b. Convert measurements from metric to English units and vice versa.
10. Select typical fasteners used in agriculture power and machinery including bolts, nuts, washers, keys, snap rings, screws, pins, and studs.
 - a. Identify common fasteners used in Agriculture Power and Machinery including screws, bolts, nuts, washers, keys, snap rings, pins, and studs.
 - b. Identify bolt types, grades, and thread measuring terms.
 - c. Measure bolt and nut length, diameter, and thread type.
 - d. Discuss tools and procedures for extracting broken bolts and restoring internal and external threads.
 - e. Identify tools and equipment used to create internal and external threads.
11. Explain the concepts of power including work, force, and torque, and the elements of power including PTO (power take off) horsepower, drawbar horsepower, and brake horsepower.
 - a. Explain concepts of Newton's Laws.
 - b. Describe the terms of power including work, force, and torque.
 - c. Explain the differences in PTO, drawbar, and brake horsepower.
12. Explain methods of power transmission and braking.
 - a. Describe the transmission of power through direct drive.
 - b. Describe the transmission of power through pulleys and belts.
 - c. Describe the transmission of power through chains and sprockets.
 - d. Describe the transmission of power through gears and shafts.
 - e. Describe the transmission of power through hydraulic and pneumatic applications.
13. Identify the different types and discuss their operation and use of clutches.
 - a. Describe types of clutches and their operation (centrifugal, mechanical, and hydraulic).
 - b. Identify uses of the different types of clutches.
14. Describe the operation of the four-stroke cycle engine.
 - a. Identify the major components (intake, compression, power, and exhaust) of a four-stroke cycle engine.
 - b. Describe the events occurring in one cycle of a four-stroke engine.
15. Describe the operation of the two-stroke cycle engine.
 - a. Identify the components of a two-stroke cycle engine.
 - b. Describe the events occurring in one cycle of a two-stroke engine.
 - c. Calculate ratios of oil and gasoline and mix fuel for a two-stroke cycle engine.
16. Describe the basic operation and service of electrical systems.
 - a. Understand the basic concept of Ohm's Law.
 - b. Define common terms used in the electrical system (AC, DC, volts, watts, amps, ohms, etc.).
 - c. Identify the common sources of electricity (battery, magneto, generator, alternator).
 - d. Identify the parts of a basic circuit.

- e. Identify the instruments used in checking electrical circuits.
 - f. Measure voltage, amperage, and resistance of the electrical circuits.
 - g. Service the ignition circuit on a compact gas engine.
17. Perform compact gasoline engine service.
- a. Demonstrate how to find and use information in operator's manuals and manufacturer's specifications.
 - b. Describe the functions of engine oil.
 - c. Describe the Society of Automotive Engineers (SAE) viscosity rating system.
 - d. Describe the American Petroleum Institute (API) classifications.
 - e. Select compact engine oil viscosity according to seasonal temperature.
 - f. Identify the components of the cooling system of an air cooled engine.
 - g. Identify the components of a gasoline fuel system on a compact engine.
 - h. Identify the types of carburetors and fuel systems on a compact engine.
 - i. Identify the types of air filters on compact engines.
 - j. Identify the types of governor systems used on compact engines.
 - k. Perform preventative maintenance on compact engines.
18. Disassemble, inspect, and reassemble a compact gasoline engine
- a. Disassemble, clean, and inspect the parts of a compact engine for wear or damage.
 - b. Assemble a compact engine to manufacturer's specifications.
 - c. Performance test and adjust a compact engine.
19. Read and interpret operator's manual to determine daily maintenance on equipment.
- a. Select correct manuals to determine daily maintenance required on equipment.
 - b. Obtain manufacturer's specifications for daily maintenance requirements on equipment.
20. Perform daily maintenance on tractors and equipment.
- a. Check tires for air pressure.
 - b. Check fluid levels (engine oil, coolant, and hydraulic system).
 - c. Lubricate the chassis and steering linkage.
 - d. Inspect brakes for correct adjustment.
 - e. Check safety equipment and gauges.
21. Identify the different types of equipment used in agricultural operations and describe their operation and key maintenance procedures.
- a. Identify types of planting and tillage equipment and describe their operation and key maintenance procedures.
 - b. Identify types of lawn turf equipment and describe their operation and key maintenance procedures.
 - c. Identify types of harvesting equipment and describe their operation and key maintenance procedures.
 - d. Identify types of forage equipment and describe their operation and key maintenance procedures.
 - e. Identify types of irrigation equipment and describe their operation and key maintenance procedures.
 - f. Identify types of poultry equipment and describe their operation and key maintenance procedures.
 - g. Identify types of forestry equipment and describe their operation and key maintenance procedures.

22. Describe procedures for preparing agricultural equipment for refinishing.
 - a. Perform procedures for cleaning equipment for refinishing.
 - b. Repair and/or replace damaged parts.
 - c. Prepare surface for repainting.
23. Demonstrate procedures for repainting agricultural equipment.
 - a. Demonstrate procedures to mix and prepare paint for spraying.
 - b. Set up and adjust paint gun.
 - c. Apply paint coats according to manufacturer's specifications.
 - d. Clean and prepare paint gun for storage.
24. Explain principles of hydraulics.
 - a. Describe safety precautions related to hydraulics systems.
 - b. Describe the physical laws hydraulics.
 - c. Read and interpret hydraulics schematics.
25. Explain the functions of the basic hydraulic components.
 - a. Identify the basic hydraulic components.
 - b. Describe how basic hydraulics components function.
26. Demonstrate maintenance of hydraulic systems.
 - a. Check fluid levels and condition.
 - b. Service filter system.
 - c. Change hydraulic fluids.
 - d. Inspect system for external leaks and correct where necessary.
27. Test a hydraulic system.
 - a. Use the manufacturer's service library to determine specifications.
 - b. Pressure test a hydraulic system.
28. Describe basic operating principals of diesel engines.
 - a. Identify the differences in a diesel engine and a gasoline engine.
 - b. Describe the sequence of events in a four-stroke cycle diesel engine.
29. Identify the components of the diesel engine.
 - a. Identify the components of the basic engine block assembly including the cylinder head, pistons, connecting rods, crankshaft and bearings, camshaft and bearings, cylinder liners, and engine block.
 - b. Describe the functions of the components of the diesel engine including the cylinder head, pistons, connecting rods, crankshaft and bearings, camshaft and bearings, cylinder liners, and engine block.
30. Identify the components of the lubrication system.
 - a. Identify the oil pump, oil cooler, filter, and relief valve.
 - b. Describe the functions of the oil pump, oil cooler, filter, and relief valve.
31. Identify the components of cooling system.
 - a. Identify the components of the cooling system including radiator, thermostat, water pump, radiator cap, radiator hoses, belts and pulleys, coolant and shroud.
 - b. Describe the functions of the components of the cooling system including radiator, thermostat, water pump, radiator cap, radiator hoses, belts and pulleys, coolant and shroud.
32. Identify the components of fuel system.
 - a. Identify the components of the fuel system including reservoir, transfer pump, injector pump, injectors, filter, valves, lines and hoses, and fuel.

- b. Describe the functions of the components of the fuel system including reservoir, transfer pump, injector pump, injectors, filter, valves, lines and hoses, and fuel.
33. Disassemble and assemble a diesel engine and service the support systems.
 - a. Disassemble a diesel engine.
 - b. Inspect components according to manufacturer's specifications.
 - c. Assemble a diesel engine and service the support system components.
 34. Describe the use of electronics systems used in agriculture.
 - a. Describe uses of sensors and monitoring systems.
 - b. Describe uses of controllers.
 - c. Discuss the role of integrated systems.
 - d. Identify the types of electric motors and their application and use.
 35. Investigate electronics systems used on tractors, implements, and stationary systems.
 - a. Discuss the use of electronic sensors, processors, and controllers on tractors and implements.
 - b. Identify components of electronic systems and their function or purpose.
 - c. Interpret electronic schematics, and blueprints.
 36. Identify parts and functions of charging systems on internal combustion engines.
 - a. Describe safety procedures for the charging system.
 - b. Identify the components of the charging system.
 - c. Test charging circuit operation according to specifications.
 - d. Service the charging system.
 37. Identify components and functions of starting systems on internal combustion engines.
 - a. Describe safety procedures for the storage battery.
 - b. Identify the components of the starting system.
 - c. Test starting system components according to specifications.
 - d. Service components of a starting system according to specifications.
 38. Describe principles of diagnostics.
 - a. Explain the meaning and importance of diagnostics.
 - b. Describe the processes and tools used in equipment diagnostics.
 - c. Apply diagnostic procedures in solving a problem.
 39. Review the operator's manuals to determine procedures for safe operation of agricultural equipment.
 - a. Identify equipment controls and describe their function.
 - b. Identify instruments and indicators and describe their function.
 40. Operate tractor and equipment safely.
 - a. Conduct inspection prior to operation.
 - b. Operate the tractor safely including starting, warm-up, clutch engagement, and brake controls.
 - c. Attach, set up, and adjust an implement on a tractor.
 - d. Demonstrate operation under field conditions.
 41. Review manufacturer's manuals for periodic maintenance.
 - a. Read and interpret manufacturer's manuals to obtain specifications for periodic maintenance.
 - b. Perform periodic maintenance according to manufacturer's specifications.

42. Review manufacturer's manuals for seasonal maintenance.
 - a. Read and interpret manufacturer's manuals to obtain specifications for seasonal maintenance.
 - b. Perform seasonal maintenance according to manufacturer's specifications.
43. Discuss the concepts and operating principles of precision agriculture technology.
 - a. Identify and describe the components of a precision agriculture technology system.
 - b. Describe the use of global positioning receivers in precision agriculture.
 - c. Describe the use of spatial imagery in precision agriculture.
 - d. Describe the use of geographic information system software in precision agriculture.
 - e. Describe the use of variable rate application in precision agriculture.
 - f. Describe the use of yield monitoring in precision agriculture.
44. Research advanced technology being utilized in agriculture.
 - a. Establish areas of new technology applications.
 - b. Determine locations where demonstrations may be observed.
 - c. Conduct investigations to observe and record applications of advanced technology.

Appendix A: Standards for Agricultural Equipment Technicians¹

Safety

- SAF1 Demonstrate safe work practices
 SAF2 Possess an adequate knowledge of safety skills and procedures of basic machine operation and diagnosis

Hydraulics

- HYD 1 Calculate hydraulic pressure and flow using Pascal's law.
 HYD 2 Demonstrate the theory of operation of an open and closed center hydraulic system.
 HYD 3 Demonstrate the theory of hydraulic pump and motor operation.
 HYD 4 Demonstrate the theory of closed center, constant, and variable pressure hydraulic system operation.
 HYD 5 Diagnose problems of an open and closed center hydraulic system.
 HYD 6 Disassemble and repair a hydraulic component following tech manual instructions and specifications.
 HYD 7 Utilize a flow rater and test gauges to measure performance in a hydraulic system.
 HYD 8 Identify the symbols of an ISO hydraulic diagram and locate the components on equipment.

Electrical Systems

- ELT 1 Use Ohms law to demonstrate/predict DC electrical behavior.
 ELT 2 Measure voltage and current flow in electrical circuits.
 ELT 3 Demonstrate proficient use of a digital multi-meter.
 ELT 4 Recognize and test electrical components and devices.
 ELT 5 Identify symbols on an ISO electrical diagram and locate the components on equipment.
 ELT 6 Use ISO schematics in diagnostic procedures.
 ELT 7 Follow diagnostic and repair procedures.

Mobile Heating, Ventilation, and Air Conditioning (HVAC) Systems

- HVA 1 Describe the fundamentals of operation of a mobile HVAC system.
 HVA 2 Perform test, repair, and retrofit procedures.
 HVA 3 Identify and describe the HVAC laws.
 HVA 4 Use test gauges and thermometers in measuring performance of the HVAC system.
 HVA 5 Demonstrate safe and proper handling of refrigerants.
 HVA 6 Charge and verify proper operation of various refrigerant systems.

¹Standards for Agricultural Equipment Technicians were adapted from the John Deere Ag Tech Competency list, published by Deere and Company, Moline, IL.

Engines and Fuel Systems

- EFS 1 Disassemble and reassemble an engine using established procedures.
- EFS 2 Describe the theory of operation of an internal combustion engine.
- EFS 3 Utilize a dynamometer to measure engine performance and diagnostic testing procedures.
- EFS 4 Describe the theory of operation of various fuel systems.
- EFS 5 Perform diagnostic and repair procedures on various fuel systems.
- EFS 6 Identify and describe legal limitations with respect to fuel systems.

Powertrains

- POW 1 Describe basic operational theories of power trains.
- POW 2 Diagnose, disassemble, and reassemble various power trains.
- POW 3 Describe basic operational theories associated with wet and dry brakes, torsion dampers, and torque converters.
- POW 4 Diagnose, disassemble, and reassemble various wet and dry brakes, torsion dampers, and torque converters.
- POW 5 Describe basic operational theories of final drive systems.
- POW 6 Diagnose, disassemble, and reassemble various final drive and differential systems.

Harvesting Systems

- HAR 1 Describe the fundamentals of various harvesting systems.
- HAR 2 Perform maintenance, diagnostic, and repair procedures on various harvesting systems.
- HAR 3 Set up and adjust harvesting equipment prior to and in-field use to optimize performance according to conditions.

Tillage, Seeding, and Chemical Application Systems

- TSC 1 Describe the fundamentals of machine operation included proper tractor compatibility.
- TSC 2 Describe primary and secondary tillage practices.
- TSC 3 Set up and adjust various tillage, seeding, and chemical application equipment prior to field use.
- TSC 4 Perform maintenance, diagnostic, and repair procedures on various tillage, seeding, and chemical application equipment.
- TSC 5 Set up and adjust various tillage, seeding, and chemical application equipment prior to and in-field use to optimize tractor and implement performance according to conditions.
- TSC 6 Describe laws and regulations related to tillage, seeding, and chemical applications.
- TSC 7 Demonstrate use of protective apparatus when diagnosing, maintaining, and repairing chemical application equipment.

Service Department Policies and Procedures

- SER 1 Describe the role of the service technician in the operation and profitability of a service department.
- SER 2 Complete a time card and a work order.
- SER 3 Accurately communicate a complaint, cause, and corrective actions for a given job.
- SER 4 Locate and utilize all service information resources.
- SER 5 Demonstrate positive customer relations.
- SER 6 Describe continuing education opportunities.

Advanced Technology

- TEC 1 Demonstrate proficiency in using service software and online resources.
- TEC 2 Demonstrate proficiency in using shop management software and hardware.

Appendix B: Related Academic Standards²

Reading

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare/contrast, cause/effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)

Mathematics Computation

- M1 Addition of Whole Numbers (no regrouping, regrouping)
- M2 Subtraction of Whole Numbers (no regrouping, regrouping)
- M3 Multiplication of Whole Numbers (no regrouping, regrouping)
- M4 Division of Whole Numbers (no remainder, remainder)
- M5 Decimals (addition, subtraction, multiplication, division)
- M6 Fractions (addition, subtraction, multiplication, division)
- M7 Integers (addition, subtraction, multiplication, division)
- M8 Percents
- M9 Algebraic Operations

Applied Mathematics

- A1 Numeration (ordering, place value, scientific notation)
- A2 Number Theory (ratio, proportion)
- A3 Data Interpretation (graph, table, chart, diagram)
- A4 Pre-Algebra and Algebra (equations, inequality)
- A5 Measurement (money, time, temperature, length, area, volume)
- A6 Geometry (angles, Pythagorean theory)
- A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
- A8 Estimation (rounding, estimation)

Language

- L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
- L2 Sentence Formation (fragments, run-on, clarity)
- L3 Paragraph Development (topic sentence, supporting sentence, sequence)
- L4 Capitalization (proper noun, titles)
- L5 Punctuation (comma, semicolon)
- L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

Spelling

- S1 Vowel (short, long)
- S2 Consonant (variant spelling, silent letter)
- S3 Structural Unit (root, suffix)

² CTB/McGraw-Hill LLC. (1994). *Tests of adult basic education, Forms 7 and 8*. Monterey, CA: Author. Reproduced with permission of CTB/McGraw-Hill LLC. TABE is a registered trademark of The McGraw-Hill Companies, Inc. Copyright © 1994 by CTB/McGraw-Hill LLC. Reproduction of this material is permitted for educational purposes only.

Appendix C: 21st Century Skills³

CS1 Global Awareness

- Using 21st century skills to understand and address global issues
- 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
- Promoting the study of non-English language as a tool for understanding other nations and cultures

CS2 Financial, Economic, and Business Literacy

- Knowing how to make appropriate personal economic choices
- Understanding the role of the economy and the role of business in the economy
- Applying appropriate 21st century skills to function as a productive contributor within an organizational setting
- Integrating oneself within and adapting continually to our nation's evolving economic and business environment

CS3 Civic Literacy

- Being an informed citizen to participate effectively in government
- Exercising the rights and obligations of citizenship at local, state, national, and global levels
- Understanding the local and global implications of civic decisions
- Applying 21st century skills to make intelligent choices as a citizen

CS4 Information and Communication Skills

- Information and media literacy skills: Analyzing, accessing, managing, integrating, evaluating, and creating information in a variety of forms and media; understanding the role of media in society
- Communication skills: Understanding, managing, and creating effective oral, written, and multimedia communication in a variety of forms and contexts

CS5 Thinking and Problem-Solving Skills

- Critical thinking and systems thinking: Exercising sound reasoning in understanding and making complex choices, understanding the interconnections among systems
- Problem identification, formulation, and solution: Ability to frame, analyze, and solve problems
- Creativity and intellectual curiosity: Developing, implementing, and communicating new ideas to others, staying open and responsive to new and diverse perspectives

CS6 Interpersonal and Self-Directional Skills

- Interpersonal and collaborative skills: Demonstrating teamwork and leadership, adapting to varied roles and responsibilities, working productively with others, exercising empathy, respecting diverse perspectives
- Self-direction: Monitoring one's own understanding and learning needs, locating appropriate resources, transferring learning from one domain to another
- Accountability and adaptability: Exercising personal responsibility and flexibility in personal, workplace, and community contexts; setting and meeting high standards and goals for one's self and others; tolerating ambiguity

³ 21st century skills. (n.d.). Washington, DC: Partnership for 21st Century Skills.

- Social responsibility: Acting responsibly with the interests of the larger community in mind; demonstrating ethical behavior in personal, workplace, and community contexts