Agriculture, Food & Natural Resources Career Cluster
Agricultural Electricity & Electrical Controls
Course Number 01.42600

Course Description

This laboratory course is designed to provide students with introductory level experiences in selected major areas of agricultural mechanics technology associated with the design and installation of electric motor and non-motor load electrical circuits designed for use in agricultural structures, and agricultural industry applications. Topics covered include electrical terms and theory, branch and feeder circuit design and installation, service entrance equipment selection and installation, electric motors and motor controllers, switching devices including thermostats, proximity sensors, float switches, clock timers, relays, and similar devices. Learning activities include information, skill development and problem solving. Classroom and laboratory activities are supplemented through supervised agricultural experiences and leadership programs and activities.

Course Standard 1

AFNR-AEEC-1

The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept.

Standard: Demonstrate employability skills required by business and industry.

The following elements should be integrated throughout the content of this course.

1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.

Person-to-Person Etiquette	Telephone and Email Etiquette	Cell Phone and Internet Etiquette	Communicating At Work	Listening
Interacting with Your Boss	Telephone Conversations	Using Blogs	Improving Communication Skills	Reasons, Benefits, and Barriers
Interacting with Subordinates	Barriers to Phone conversations	Using Social Media	Effective Oral Communication	Listening Strategies
Interacting with Co-workers	Making and Returning Calls		Effective Written Communication	Ways We Filter What We Hear
Interacting with Suppliers	Making Cold Calls		Effective Nonverbal Skills	Developing a Listening Attitude
	Handling Conference Calls		Effective Word Use	Show You Are Listening
	Handling Unsolicited Calls		Giving and Receiving Feedback	Asking Questions
				Obtaining Feedback
				Getting Others to Listen

Nonverbal Communication	Written Communication	Speaking	Applications and Effective Résumés
Communicating Nonverbally	Writing Documents	Using Language Carefully	Completing a Job Application
Reading Body Language and mixed Messages	Constructive Criticism in Writing	One-on-One Conversations	Writing a Cover Letter
Matching Verbal and Nonverbal communication		Small Group Communication	Things to Include in a Résumé

Improving Nonverbal Indicators		Large Group Communication	Selling Yourself in a Résumé
Nonverbal Feedback		Making Speeches	Terms to Use in a Résumé
Showing Confidence Nonverbally		Involving the Audience	Describing Your Job Strengths
Showing Assertiveness		Answering Questions	Organizing Your Résumé
		Visual and Media Aids	Writing an Electronic Résumé
		Errors in Presentation	Dressing Up Your Résumé

1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

Teamwork and Problem Solving	Meeting Etiquette
Thinking Creatively	Preparation and Participation in Meetings
Taking Risks	Conducting Two-Person or Large Group Meetings
Building Team Communication	Inviting and Introducing Speakers
	Facilitating Discussions and Closing
	Preparing Visual Aids
	Virtual Meetings

1.3 Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

Problem Solving	Customer Service	The Application Process	Interviewing Skills	Finding the Right Job
Transferable Job Skills	Gaining Trust and Interacting with Customers	Providing Information, Accuracy and Double Checking	Preparing for an Interview	Locating Jobs and Networking
Becoming a Problem Solver	Learning and Giving Customers What They Want	Online Application Process	Questions to Ask in an Interview	Job Shopping Online
Identifying a Problem	Keeping Customers Coming Back	Following Up After Submitting an Application	Things to Include in a Career Portfolio	Job Search Websites
Becoming a Critical Thinker	Seeing the Customer's Point	Effective Résumés:	Traits Employers are Seeking	Participation in Job Fairs
Managing	Selling Yourself and the Company	Matching Your Talents to a Job	Considerations Before Taking a Job	Searching the Classified Ads
	Handling Customer Complaints	When a Résumé Should be Used		Using Employment Agencies
	Strategies for Customer Service			Landing an Internship
				Staying Motivated to Search

1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.

Workplace Ethics	Personal Characteristics	Employer Expectations	Business Etiquette	Communicating at Work
Demonstrating Good Work Ethic	Demonstrating a Good Attitude	Behaviors Employers Expect	Language and Behavior	Handling Anger
Behaving Appropriately	Gaining and Showing Respect	Objectionable Behaviors	Keeping Information Confidential	Dealing with Difficult Coworkers
Maintaining Honesty	Demonstrating Responsibility	Establishing Credibility	Avoiding Gossip	Dealing with a Difficult Boss
Playing Fair	Showing Dependability	Demonstrating Your Skills	Appropriate Work Email	Dealing with Difficult Customers

Using Ethical Language	Being Courteous	Building Work Relationships	Cell Phone Etiquette	Dealing with Conflict
Showing Responsibility	Gaining Coworkers' Trust		Appropriate Work Texting	
Reducing Harassment	Persevering		Understanding Copyright	
Respecting Diversity	Handling Criticism		Social Networking	
Making Truthfulness a Habit	Showing Professionalism			
Leaving a Job Ethically				

1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.

Expected Work Traits	Teamwork	Time Management
Demonstrating Responsibility	Teamwork Skills	Managing Time
Dealing with Information Overload	Reasons Companies Use Teams	Putting First Things First
Transferable Job Skills	Decisions Teams Make	Juggling Many Priorities
Managing Change	Team Responsibilities	Overcoming Procrastination
Adopting a New Technology	Problems That Affect Teams	Organizing Workspace and Tasks
	Expressing Yourself on a Team	Staying Organized
	Giving and Receiving Constructive Criticism	Finding More Time
		Managing Projects
		Prioritizing Personal and Work Life

1.6 Present a professional image through appearance, behavior and language.

On-the-Job Etiquette	Person-to-Person Etiquette	Communication Etiquette	Presenting Yourself
Using Professional Manners	Meeting Business Acquaintances	Creating a Good Impression	Looking Professional
Introducing People	Meeting People for the First Time	Keeping Phone Calls Professional	Dressing for Success
Appropriate Dress	Showing Politeness	Proper Use of Work Email	Showing a Professional Attitude
Business Meal Functions		Proper Use of Cell Phone	Using Good Posture
Behavior at Work Parties		Proper Use in Texting	Presenting Yourself to Associates
Behavior at Conventions			Accepting Criticism
International Etiquette			Demonstrating Leadership
Cross-Cultural Etiquette			
Working in a Cubicle			

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence L9-10RST 1-10 and L9-10WHST 1-10:

Georgia Standards of Excellence ELA/Literacy standards have been written specifically for technical subjects and have been adopted as part of the official standards for all CTAE courses.

Course Standard 2

AFNR-AEEC-2

Orient and apply the comprehensive program of agricultural education, learn to work safely in the agriculture lab and work sites, demonstrate selected competencies in leadership through the FFA and agricultural industry organizations, and develop plans for a Supervised Agricultural Experience Program (SAEP).

2.1 Explain the role of the Agriculture Education program and the FFA in personal development.
2.2 Demonstrate knowledge learned through a SAEP.
2.3 Designs, implements, and documents SAE by recording steps, skills acquired, and financial information.
2.4 Develop leadership and personal development skills through participation in the FFA.
2.5 Explore the history and background of the FFA.

Course Standard 3

AFNR-AEEC-3

Identify careers in the agricultural mechanics industry in the areas of agricultural construction and electrical systems.

3.1 Explore career opportunities in Agricultural Mechanics through the FFA and Agriculture Education Program.
3.2 Explore the professional organizations associated with agricultural mechanics skills and related occupations.
3.3 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.
3.4 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.
3.5 Exhibit critical thinking and problem solving skills to locate, analyze, and apply information in career planning and employment situations related to agricultural mechanics.
3.6 Apply the appropriate skill sets to be productive in a changing, technological, and diverse workplace to be able to work independently, interpret data, and apply team work skills.

Course Standard 4

AFNR-AEEC-4

Determine and illustrate safety in the agriculture lab and agriculture worksites as it pertains to electricity.

4.1 Identify hazards associated with electric current in agricultural mechanics labs and work sites.
4.2 Select safety equipment and procedures for various agriculture-related activities.
4.3 Discuss the importance of safety in agricultural occupations.
4.4 Demonstrate safety procedures and appropriate behavior while working in the agriculture classroom, labs, and/or work sites.
4.5 Describe and identifies the basic principles of electrical theory.
4.6 Describe types of electrical circuits.
4.7 Define electrical terms used in agricultural worksites.
4.8 Describe the relationship between watts, volts, amps, and resistance.
4.9 Effectively measure amperage, voltage, and resistance using appropriate measuring instruments.
4.10 Analyze electrical grounding and grounding conductor systems.
4.11 Justify the need for an effective path to ground.
4.12 Explain the purpose of the National Electrical Code.

Course Standard 5

AFNR-AEEC-5

Demonstrate skills in selecting tools, conductors, devices, electrical enclosures, and related materials necessary for planning electrical circuits for agricultural and residential applications.

- 5.1 Identify and demonstrate the proper use of tools commonly used in the electrical industry.
- 5.2 Identify types of electrical cable used in agricultural applications.
- 5.3 Calculate load for specific circuit applications.
- 5.4 Select conductors for circuit applications based on given load, location, temperature and distance parameters.
- 5.5 Define series, parallel, AC & DC circuits and their applications.
- 5.6 Identify electrical symbols used in electrical schematics and floor plans.
- 5.7 Plan electrical circuits for given applications and scenarios in accordance with the National Electrical Code.
- 5.8 Create electrical schematics that use appropriate electrical symbols and follow National Electrical Code requirements.
- 5.9 Calculate load requirements for selecting service entrance equipment in accordance with the requirements of the National Electrical Code.
- 5.10 Select service entrance equipment including service entrance panels, overcurrent protection devices, disconnects and conductors for various applications in accordance with the requirements of the National Electrical Code.
- 5.11 Select switches, receptacles, lighting outlet devices, grounding conductors, solderless connectors and related materials for use in agricultural and residential electric circuits.
- 5.12 Calculate device box sizes in accordance with the requirements of the National Electrical Code.
- 5.13 Analyze wiring installation details of branch and feeder circuits in order to create a bill of materials and determine cost for the installation of branch circuits.

Course Standard 6

AFNR-AEEC-6

Demonstrate skills in using appropriate electrical tools and the installation of electrical enclosures, grounding equipment, conductors, and electrical devices for branch and feeder circuits in agricultural and residential applications.

- 6.1 Demonstrate proper use of tools for preparing conductors, mounting electrical enclosures and connecting devices for branch and feeder circuits.
- 6.2 Install service entrance equipment.
- 6.3 Install electrical grounding conductors, grounding electrodes and related grounding material in accordance with the provisions of the National Electrical Code.
- 6.4 Analyze electrical circuit schematics and install branch circuits according to the circuit schematic.
- 6.5 Demonstrate the proper use of electrical testing equipment for measuring volts, amps and resistance.
- 6.6 Evaluate electrical circuits for continuity, ground faults and stray voltage.

Course Standard 7

AFNR-AEEC-7

Develop an understanding of the relationship between magnetism and electricity, and the operating principles of single and three phase electric motors.

- 7.1 Demonstrate an understanding of the basic principles of magnetism.
- 7.2 Compare and contrast permanent magnets and electromagnets.

7.3 Test the principle of the permanent electromagnet as it relates to electric motors.
7.4 Identify components of electric motors and define terms.
7.5 Distinguish between single phase and three phase power.
7.6 Select electric motors for given applications based on phase type, input voltage, load, and National Electrical Code requirements.
7.7 Analyze and interpret electric motor name plate information.
7.8 Compare and explain the electrical schematics for a dual voltage electric motor wired for low voltage (115 V) and high voltage (230 V) operation.

Course Standard 8

AFNR-AEEC-8

Demonstrate the knowledge and skills necessary for selecting conductors, disconnect means, manual and mechanically operated switches, automatic controls, relays, and motor controllers for motor circuits used in the agriculture industry.

8.1 Select conductor size for motor loads in accordance with the requirements of the National Electrical Code.
8.2 Diagram and describe types of control devices.
8.3 Classify control devices according to the number of poles and throws.
8.4 Compare and contrast single break and double break controllers.
8.5 Select control devices based on contact rating.
8.6 Identify types of manual switches.
8.7 Select switch configurations for various circuits according to National Electrical Code Requirements.
8.8 Identify types of mechanically operated switches.
8.9 Select mechanically operated switches for different types of applications.
8.10 Use an ohm meter to identify terminals and actuating points on mechanical switches.
8.11 Identify types of automatic controls.
8.12 Define terms associated with automatic controls.
8.13 Differentiate between automatic line devices and low-voltage devices.
8.14 Install automatic devices to control electric motors.
8.15 Explain the role or relays in controlling electric motor circuits.
8.16 Differentiate between manual and magnetic motor controllers.
8.17 Identify types of overload protection devices.
8.18 Use an ohm meter to identify terminals on magnetic starters.
8.19 Install magnetic starters with automatic controllers in motor control circuits.
8.20 Install magnetic starters with push-button stations in motor control circuits.