

**Science, Technology, Engineering and Mathematics Career Cluster
Advanced AC and DC Circuits
Course Number 21.45300**

Course Description:

As the second course in the Electronics Pathway, this course is designed for students interested in careers related to the design, production, analysis, repair, and operation of devices that use electronics. The course is designed around major individual and class projects that promote critical thinking, real world problem solving, and abstract reasoning that encourage the student to become an investigative lifelong learner. Students will create artifacts that demonstrate application of competencies in technical, academic, cognitive, and personal skills through daily work, team work, and homework, formative and informative assessments. The prerequisite for this course is Foundations of Electronics.

Course Standard 1

STEM-AACDCC-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

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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

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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

STEM- AACDCC 2

Analyze fields of engineering and electronic specializations (i.e. aeronautical, automotive, chemical, civil, industrial, and mechanical, computer software, electrical, and biomedical) and identify associated career tracks.

- 2.1 Design a project that conveys information about electronic specialization.
- 2.2 Participate in activities related to career interests.
- 2.3 Relate each engineering and electronic discipline to a green environment and sustainability situation.
- 2.4 Develop solutions to an ethical issue in engineering and electronic specialization.
- 2.5 Analyze an ethical situation related to engineering graphics and engineering.
- 2.6 Maintain a journal that relates standards in the course to the project work.

Course Standard 3

STEM- AACDCC-3

Describe and follow safety, health and environmental standards related to Science, Technology, Engineering and Math (STEM) workplaces.

- 3.1 Implement workplace and product safety standards such as Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), International Organization for Standardization (ISO), Good Manufacturing Practice (GMP), and Underwriters Laboratories (UL).
- 3.2 Accurately interpret safety signs, symbols, and labels (Hazardous Communications).
- 3.3 Demonstrate and incorporate safe laboratory procedures in lab, shop, and field environments.
- 3.4 Explain how the incorporation or lack of safety [practices impact the economy and costs of safety in business and industry.
- 3.5 Identify, select, and use appropriate Personal protective Equipment (PPE), follow work area organization procedures and follow Standard Operating Procedures (SOP) when performing work.

Course Standard 4

STEM- AACDCC-4

Investigate the history and development of analog circuits.

- 4.1 Discuss the history of analog circuits.
- 4.2 Apply analog circuits.
- 4.3 Identify and describe patterns of analog signals.
- 4.4 Evaluate the advantages and disadvantages of analog signaling.
- 4.5 Predict the future of analog electronics.

Course Standard 5

STEM- AACDCC-5

Research and present operational characteristics and applications of amplifiers.

- 5.1 Define and discuss power supplies.
- 5.2 Technically sketch or draw and construct a power supply circuit
- 5.3 Define and discuss the different types of transistors (Bipolar junction transistor or BJT and metal oxide semiconductor or MOS).
- 5.4 Define and discuss different types of amplifiers (Class A, B, D amplifiers).
- 5.5 Demonstrate negative feedback differential amplifiers.
- 5.6 Conduct analysis and troubleshooting.

Course Standard 6

STEM- AACDCC-6

Research and define oscillator characteristics and applications.

- 6.1 Discuss the characteristics of oscillators related to positive feedback and unity gain.
- 6.2 Define and discuss analog crystal oscillator circuits.
- 6.3 Define and discuss digital oscillator circuits (comparators, latches).
- 6.4 Conduct analysis and troubleshooting.
- 6.5 Create a project to demonstrate knowledge of oscillator applications.

Course Standard 7

STEM- AACDCC-7

Research and define operating characteristics and applications of communication circuits.

- 7.1 Distinguish, contrast and compare analog and digital signals.
- 7.2 Identify and describe modulation and demodulation.
- 7.3 Demonstrate and apply simple receivers.
- 7.4 Define and discuss super heterodyne receivers.
- 7.5 Calculate frequency modulation and single sideband.
- 7.6 Conduct receiver troubleshooting.
- 7.7 Technically sketch or draw and then construct and predict results for communication circuits.

Course Standard 8

STEM- AACDCC-8

Research and present characteristics and construction of integrated circuits.

- 8.1 Recognize integrated circuits.
- 8.2 Explain fabrication.
- 8.3 Technically sketch or draw and then construct and critique the 555 timer.
- 8.4 Estimate and measure to check outputs
- 8.5 Discuss additional integrated circuits.
- 8.6 Model troubleshooting integrated circuits.

Course Standard 9

STEM- AACDCC-9

Research and present operational characteristics of electronic control devices and circuits.

- 9.1 Classify electronic control devices and circuits.
- 9.2 Identify the silicon-controlled rectifier.
- 9.3 Technically sketch or draw and construct full-wave devices.
- 9.4 Calculate feedback in control devices.
- 9.5 Identify and discuss three terminal regulators.
- 9.6 Discuss regulated power supplies.
- 9.7 Discuss and demonstrate troubleshooting of electronic control circuits.

Course Standard 10

STEM- AACDCC-10

Create a digital project that displays mastery of the standards involved with electronics.

- 10.1 Present the constructed projects from the standards in a digital portfolio through pictures, drawings, data and analysis.
- 10.2 Make recommendations for improvements on each project based on experiences gained from the process.