Introduction to Digital Electronics and Programming	
CURRICULUM/CONTENT AREA	**COURSE LENGTH**
Applied & Technical Education (ATE)	*9 weeks*
GRADE LEVEL	**DATE LAST REVIEWED**
9 - 12	*2022 (new)*
PREREQUISITE(s) ***if applicable***	**BOARD APPROVAL DATE**
	11/15/2022
PRIMARY RESOURCE ***if applicable***	

DESIRED RESULTS

COURSE DESCRIPTION AND PURPOSE

This introduction to electronics cousre is a comprehensive, hands-on learning program that guides students through the fundamental concepts of electronics and coding, and challenges them to assemble, wire and program projects using the arduino platform. This course provides a foundation for students who are interested in electrical engineering, electronics, circuit design or coding/programming.

ENDURING UNDERSTANDINGS *Students will understand that...*	**ESSENTIAL QUESTIONS** *Students will keep considering...*
Creativity, innovation, and critical thinking are essential for success in a technologically advanced world.	Why is creativity and innovation important? How is creativity and innovation used in STEM Career Pathways?
	How do teams efficiently and effectively solve problems in an increasingly complex world?
	What strategies and processes can I use to become a more effective creator, thinker and problem solver?
The ability to communicate and collaborate with people with diverse backgrounds and perspectives is key to participation in a global economic society.	Why is communication and collaboration important? How do positive work behaviors and personal qualities impact communication and collaboration?
	What is effective teamwork? What strategies can I use/teams use to work better together? How can perspectives and experiences of a diverse group develop innovative solutions to a given problem?
Career and technical education provides pathways to high-demand, high-wage career opportunities, and personal fulfillment.	Why is career and life readiness important? What jobs and careers are available to meet individual and societal needs locally, regionally, and nationally?
	How might technical knowledge and skills influence one's employability and advancement opportunities within various work settings?
	What are employability skills? How do I prepare myself for a career that is in demand now and in 5, 10, or 20 years from now?

PRIORITY CAREER & TECHNICAL STANDARDS

Students will be skilled at...

Creativity, Critical Thinking, Communication and Collaboration
4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.
a: I develop effective resolutions for a given problem, decision or opportunity using available information.
b: I develop and implement a resolution for a new situation using personal knowledge and experience.

Career Development
CD4: Students will identify and apply employability skills.
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.
b: I demonstrate skills related to seeking and applying for employment to find and obtain a desired job.
c: I identify and exhibit traits for retaining employment.
d: I develop positive relationships with others.

Information, Media, Technology

IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.

a: I choose appropriate sources of data and information for a given purpose.
b: I determine the relevance, validity and timeliness of data and information.
c: I select relevant information necessary for making decisions and solving problems
d: I apply data and information to communicate ideas and create new opportunities.

PRIORITY CONTENT STANDARDS

Students will know...

Standard: BB1: Students will analyze the core concepts of technology.

Standard: ENG1: Students will analyze and demonstrate the attributes of design.

Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

Standard: ICT1: Students will analyze, select and use information and communication technologies.

Standard: MNF1: Students will be able to select and use manufacturing technologies.

Potential INDUSTRY-RECOGNIZED CREDENTIALS (IRCs) Opportunties associated with the course	Potential WORK BASED LEARNING (WBL) opportunities associated with the course
Arduino Certification	
Potential DUAL CREDIT Opportunties associated with the course	

Employability and Safety Skills		
STAGE 1: Desired Unit Results What will students understand as a result of the unit?		**STAGE 2: Assessment Evidence** By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?
ESSENTIAL QUESTION (s) What thought-provoking questions will foster inquiry, understanding, and transfer of learning?		**Success Criteria with Standards** The criteria for evaluating performance on standards is constant.
How might technical knowledge and skills influence one's employability and advancement opportunities within various work settings?		CTE Rubric Successful completion of safety test, Safe return demonstration of all tools and equipment, and continuous demonstration of safe practices and uses of tools and equipment
What are employability skills? How do I prepare myself for a career that is in demand now and in 5, 10, or 20 years from now?		CTE Rubric Successful completion of safety test, Safe return demonstration of all tools and equipment, and continuous demonstration of safe practices and uses of tools and equipment
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.**		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.13.h: I can predict how an action could result in unintended consequences, both positive and negative.	Safety, Tests, demonstrations and continuous observation
b: I develop and implement a resolution for a new situation using personal knowledge and experience.	4C2.b.6.h: I can use existing knowledge to develop a resolution for a new situation, problem or opportunity.	Safety, Tests, demonstrations and continuos observation
Career Development **CD4: Students will identify and apply employability skills.**		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.9.h: I can use positive work qualities typically desired in each of the career cluster's pathways.	Safety ,Tests, demonstrations and continuos observation
	CD4.a.10.h: I can manage work roles and responsibilities to balance them with other life roles and responsibilities.	Safety ,Tests, demonstrations and continuos observation
c: I identify and exhibit traits for retaining employment.	CD4.c.4.h: I can model behaviors that demonstrate reliability and dependability.	Safety ,Tests, demonstrations and continuos observation
	CD4.c.5.h: I can maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.	Safety ,Tests, demonstrations and continuos observation
PRIORITY CONTENT STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Standard: MNF1: Students will be able to select and use manufacturing technologies.	**MNF1.a.7.h:** I can identify safety and health protections and procedures that are critical to worker well-being.	Weekly safety and work assessments
	MNF1.a.8.h: I can use appropriate tools, materials, and machines to repair a malfunctioning system.	Weekly safety and work assessments
SUPPORTING STANDARDS AND LEARNING TARGETS		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Standard: EL7: Demonstrate safe and appropriate use of tools, machines and materials in electronics technology.	**EL7.a.6.h:** I can demonstrate the safe usage of appropriate tools, procedures and operation of equipment.	Weekly safety and work assessments
	EL7.a.7.h: I can describe personal safety precautions for working with electric and electronic devices electrical shock.	Weekly safety and work assessments

Stage 3: Learning Activities A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unforld in a natural flow?		
GUIDING UNIT QUESTIONS Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning	**STRATEGIES/ACTIVITIES** What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.	**RESOURCES/MATERIALS** This includes an applicable textbooks, software, industry recognized certification software/tools, subcriptions (such asPLTW), etc.

Fundamentals of Electronics		
STAGE 1: Desired Unit Results What will students understand as a result of the unit?		**STAGE 2: Assessment Evidence** By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?
ESSENTIAL QUESTION (s) What thought-provoking questions will foster inquiry, understanding, and transfer of learning?		**Success Criteria with Standards** The criteria for evaluating performance on standards is constant.
How do teams efficiently and effectively solve problems in an increasingly complex world?		CTE standards-based Rubric: Throughout the course, students and teachers use the rubric for communication of success criteria, reflection, goal setting, and feedback.
How might technical knowledge and skills influence one's employability and advancement opportunities within various work settings?		
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.**		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.11.h: I can determine the information needed to address an identified problem.	Through simulated problem sets and projects, students develop and implement resolutions. Students reflect on the process they used to come to a solution.
	4C2.a.12.h: I can contrast the benefits and drawbacks of various proposed resolutions to a given situation.	
	4C2.a.15.h: I can determine the best resolution for a problem, decision or opportunity based on given criteria.	
Career Development **CD4: Students will identify and apply employability skills.**		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.9.h: I can use positive workqualities typically desired in each of the career cluster's pathways.	Students reflect on employability skills as well as unit essential questions as it relates to their own career development.
Information, Media, Technology **IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.**		
c: I select relevant information necessary for making decisions and solving problems	IMT1.c.6.h: I can interpret and select appropriate information to develop a resolution for a given situation.	
PRIORITY CONTENT STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Standard: BB1: Students will analyze the core concepts of technology.	**BB1.d.6.h:** I can perform a voltage drop test and describe the relationship between voltage, current and resistance with a multimeter.	Project creation & reflection and athentic problem sets for written assessments.
Standard: MNF1: Students will be able to select and use manufacturing technologies.	**MNF1.a.8.h:** I can use appropriate tools, materials, and machines to repair a malfunctioning system.	
	MNF1.a.9.h: I can select and apply the appropriate units and scales for situations involving measurement.	
SUPPORTING STANDARDS AND LEARNING TARGETS		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Standard: EL1: Students will develop, use and apply basic electronics and electricity concepts.	**EL1.a.13.h:** I can calculate current, voltage or resistance using Ohms Law and Kirchoff's Voltage Law.	Project creation & reflection and athentic problem sets for written assessments.
	EL1.a.14.h: I can describe Watts Law.	
	EL1.a.17.h: I can convert fixed numbers to scientific notation.	
Standard: EL2: Students will develop the ability to use symbols, measurements and schematics to build, test and troubleshoot electronic circuits and systems.	**EL2.a.8.h:** I can explain the basic operation of the following electronic components: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries and Power Supplies.	Project creation & reflection and athentic problem sets for written assessments.
	EL2.a.9.h: I can recognize the following electronic components by constructing simple circuits: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries and Power Supplies.	
	EL2.a.10.h: I can demonstrate multimeter and usage.	
	EL2.a.11.h: I can explain the reasons for flux usage and describe it's interaction between metals.	
	EL2.a.12.h: I can list types of solder and reasons for choosing each.	
	EL2.a.13.h: I can describe and demonstrate the differences between good and bad mechanical and electrical solder connections.	
	EL2.b.5.h: I can explain how a series circuit is used in DC electronic equipment.	
	EL2.b.6.h: I can calculate an unknown current, voltage or resistance in a series circuit, using Ohms law.	
	EL2.b.7.h: I can explain how a parallel circuit is used in DC electronic equipment.	
	EL2.b.8.h: I can calculate an unknown current, voltage or resistance in a parallel circuit, using Ohms law.	
	EL2.b.9.h: I can apply Kirchoff's Current Law to a constructed circuit.	
	EL2.b.10.h: I can explain multimeter construction, components and usage and distinguish between digital and analog meters.	

Standard: EL3: Students will analyze and use digital electronics.	**EL3.a.5.h:** I can identify and describe the operation of common electronic components.	Project creation & reflection and athentic problem sets for written assessments.
	EL3.a.6.h: I can perform basic soldering techniques and printed circuit board construction.	
	EL3.a.7.h: I can analyze simple analog and digital circuits using common electronic test equipment and tools.	

Stage 3: Learning Activities

A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unforld in a natural flow?

GUIDING UNIT QUESTIONS Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning	**STRATEGIES/ACTIVITIES** What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.	**RESOURCES/MATERIALS** This includes an applicable textbooks, software, industry recognized certification software/tools, subcriptions (such asPLTW), etc.
How do electronic devices work?	Hands on activities and project construction	33 in 1 electronic exploration labs for all students
		Electronic training coursework
		Classroom Solder Practice Activity
		electronic equipment and consumables for soldering

Unit 2 Fundamentals of digital Programming		
STAGE 1: Desired Unit Results *What will students understand as a result of the unit?*		**STAGE 2: Assessment Evidence** *By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?*
ESSENTIAL QUESTION (s) *What thought-provoking questions will foster inquiry, understanding, and transfer of learning?*		**Success Criteria with Standards** *The criteria for evaluating performance on standards is constant.*
Why is creativity and innovation important? How is creativity and innovation used in [name of career pathway]?		CTE standards-based Rubric: Throughout the course, students and teachers use the rubric for communication of success criteria, reflection, goal setting, and feedback.
How do teams efficiently and effectively solve problems in an increasingly complex world?		
What strategies and processes can I use to become a more effective creator, thinker and problem solver?		
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.**		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.11.h: I can determine the information needed to address an identified problem.	*Through simulated problem sets and projects, students develop and implement resolutions. Students reflect on the process they used to come to a solution.*
	4C2.a.15.h: I can determine the best resolution for a problem, decision or opportunity based on given criteria.	
b: I develop and implement a resolution for a new situation using personal knowledge and experience.	4C2.b.5.h: I can apply past experience to develop a course of action for a new situation.	
	4C2.b.6.h: I can use existing knowledge to develop a resolution for a new situation, problem or opportunity.	
Career Development **CD4: Students will identify and apply employability skills.**		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.9.h: I can use positive workqualities typically desired in each of the career cluster's pathways.	*Students reflect on employability skills as well as unit essential questions as it relates to their own career development.*
c: I identify and exhibit traits for retaining employment.	CD4.c.4.h: I can model behaviors that demonstrate reliability and dependability.	*peer to peer evaulations, teacher evaluations*
d: I develop positive relationships with others.	CD4.d.6.h: I can evaluate the best method to assist co-workers in accomplishing goals and tasks.	
Information, Media, Technology **IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.**		
c: I select relevant information necessary for making decisions and solving problems	IMT1.c.6.h: I can interpret and select appropriate information to develop a resolution for a given situation.	*Project creation, tests and assessments*
PRIORITY CONTENT STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
Standard: BB1: Students will analyze the core concepts of technology.	**BB1.b.5.h:** I can select appropriate resources and explain how trade-offs between competing values, such as availability, cost, desirability and waste influenced their decision.	*Project creation & reflection and athentic problem sets for written assessments.*
	BB1.d.7.h: I can inspect and test components such as switches, connectors, relays, solid state devices and conductors and take appropriate action.	
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	**ENG1.a.9.h:** I can examine how the design needs to continually be evaluated and the ideas of the design must be redefined and improved.	
	ENG1.a.12.h: Requirements of a design, such as criteria, constraints and efficiency, sometimes compete with each other.	
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	**ENG3.a.5.h:** I can explain technological problems must be researched before they can be solved.	
Standard: MNF1: Students will be able to select and use manufacturing technologies.	**MNF1.a.8.h:** I can use appropriate tools, materials, and machines to repair a malfunctioning system.	
SUPPORTING STANDARDS AND LEARNING TARGETS		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
Standard: ENG2: Students will analyze and demonstrate engineering design.	**ENG2.b.4.h:** A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.	*Project creation & reflection and athentic problem sets for written assessments.*
Standard: ENG4: Students will develop abilities to apply the design process.	**ENG4.a.5.h:** I can identify the design problem to solve and determine how to address it.	*Project creation & reflection and athentic problem sets for written assessments.*
	ENG4.b.5.h: I can develop and produce a product or system using a design process.	
	ENG4.c.6.h: I can evaluate final solutions and communicate observation, processes and results of the entire design process, using verbal, graphic, quantitative, virtual and written means, in addition to design models.	
Standard: ENG5: Students will develop the abilities to use and maintain technological products and systems.	**ENG5.a.6.h:** I can diagnose a system that is malfunctioning and use tools, materials, or machines to repair it.	*Project creation & reflection and athentic problem sets for written assessments.*
	ENG5.a.7.h: I can document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.	

Standard: EL6: Students will explain the role of microcontrollers in process control and demonstrate use.	**EL6.a.3.h:** I can program and test an autonomous robot.	*Project creation & reflection and athentic problem sets for written assessments.*
	EL6.a.4.h: I can flowchart a microcontroller program, which contains inputs, memory, processor and outputs, to manipulate some type of mechanical device.	
	EL6.a.5.h: I can program a microcontroller to maneuver a robot.	
	EL6.a.6.h: I can discuss the makeup and parts of a microprocessor and how a microprocessor interprets code.	

Stage 3: Learning Activities

A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unforld in a natural flow?

GUIDING UNIT QUESTIONS	**STRATEGIES/ACTIVITIES**	**RESOURCES/MATERIALS**
Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning	*What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.*	*This includes an applicable textbooks, software, industry recognized certification software/tools, subcriptions (such asPLTW), etc.*
How do everyday object actually work.		Arduino Certification Exams
		Arduino CTC GO kits
		Arduino CTC GO Expansion Pack

Priority Standards	Unit 1	Unit 2
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.** a: I develop effective resolutions for a given problem, decision or opportunity using available information. b: I develop and implement a resolution for a new situation using personal knowledge and experience.	x	x
Career Development **CD4: Students will identify and apply employability skills.** a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable. b: I demonstrate skills related to seeking and applying for employment to find and obtain a desired job. c: I identify and exhibit traits for retaining employment. d: I develop positive relationships with others.	x	x
Information, Media, Technology **IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.** a: I choose appropriate sources of data and information for a given purpose. b: I determine the relevance, validity and timeliness of data and information. c: I select relevant information necessary for making decisions and solving problems d: I apply data and information to communicate ideas and create new opportunities.	x	x
Standard: BB1: Students will analyze the core concepts of technology.	x	x
Standard: ENG1: Students will analyze and demonstrate the attributes of design.		x
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.		x
Standard: ICT1: Students will analyze, select and use information and communication technologies.		
Standard: MNF1: Students will be able to select and use manufacturing technologies.	x	x