



School District of Marshfield Course Syllabus

Course Name: Electricity/Electronics
Length of Course: Semester
Credit: 1/2 Credit

Program Goal:

Empower learners to be college and career ready through standards-based experiences in the classroom and career-based learning experiences with business and industry partners.

Learners will engage through technology in design, building, problem-solving, repair or service, in a collaborative environment through theory and hands-on experiences.

Course Description:

Learn the fundamentals of electrical and electronic systems in order to build and troubleshoot working circuits and devices. Examples will be on learning how to use a multimeter to test voltage, current and resistance. Examples of activities include building circuits on electrical breadboards, residential wiring, electric motors, circuit boards, soldering electronic kits, and basic computer hardware.

Wisconsin Standards for Technology and Engineering (TE)	
Broad-Based (BB)	
BB1: Students will analyze the core concepts of technology.	
Analyze and use technological systems BB1.a	1.a.5.h: Describe how systems can fail because of design flaws, defective parts, poorly matched parts, or they were used beyond their design capabilities. 1.a.6.h: Describe how the outputs of one subsystem are the inputs of another subsystem given a prominent energy, power, and transportation system.
Analyze and use mechanisms BB1.c	1.c.5.h Given a linear, rotary and/or compound motion mechanism, students will measure and calculate units such as work, power, torque, gear ratios, and mechanical advantage.
Analyze and use electricity and electronic systems BB1.d	1.d.6.h: Perform a voltage drop test and describe the relationship between voltage, current, and resistance with a multimeter. 1.d.7.h: Inspect and test components such as switches, connectors, relays, and solid-state devices and conductors and take appropriate action.
Analyze, explain, and use control systems BB1.e	1.e.6.h: Select and perform appropriate maintenance in order for the product or system to continue functioning properly, to extend its life or to upgrade its capability given a flawed product or system.
Electronics (EL)	
EL1: Students will develop, use, and apply basic electronics and electricity concepts.	
Apply electronic theory to practice EL1.a	1.a.12.h: Explain electronic physics terminology of work and energy. 1.a.13.h: Calculate current, voltage, or resistance using Ohm’s Law and Kirchoff’s Voltage Law. 1.a.14.h: Describes Watts Law. 1.a.16.h: Demonstrate standard metric conversions. 1.a.17.h: Convert fixed numbers to scientific notation. 1.a.18.h: Explain the difference between conventional current theory and electron current theory.
EL2: Students will develop the ability to use symbols, measurements, and schematics to build, test, and troubleshoot electronic circuits and systems.	
Construct and measure a basic circuit using electronic components EL2.a	2.a.8.h: Explain the basic operation of the following electronic components: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries, and Power Supplies. 2.a.9.h: Recognize the following electronic components by constructing simple circuits: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries, and Power Supplies. 2.a.10.h: Demonstrate multimeter and usage. 2.a.11.h: Explain the reasons for flux usage and describe it’s interaction between metals.

	<p>2.a.12.h: List types of solder and reasons for choosing each.</p> <p>2.a.13.h: Describe and demonstrate the differences between good and bad mechanical and electrical solder connections.</p> <p>2.a.14.h: Analyze the process of manufacturing a printed circuit board and construct a soldered circuit.</p>
<p>Demonstrate electronic measurement to series, parallel, and combination circuits EL2.b</p>	<p>2.b.5.h: Explain how a series circuit is used in DC electronic equipment.</p> <p>2.b.6.h: Calculate an unknown current, voltage, or resistance in a series circuit using Ohm’s Law.</p> <p>2.b.7.h: Explain how a parallel circuit is used in DC electronic equipment.</p> <p>2.b.8.h: Calculate an unknown current, voltage, or resistance in a parallel circuit using Ohm’s Law.</p> <p>2.b.9.h: Apply Kirchoff’s Current Law to a construction circuit.</p> <p>2.b.10.h: Explain multimeter construction, components, and usage, and distinguish between digital and analog meters.</p>
<p>EL3: Students will analyze and use digital electronics.</p>	
<p>Analyze, develop, use, and apply digital electronics EL3.a</p>	<p>3.a.5.h: Identify and describe the operation of common electronic components.</p> <p>3.a.6.h: Perform basic soldering techniques and printed circuit board construction.</p>
<p>EL7: Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology.</p>	
<p>Demonstrate, apply, and measure electronic safety concepts applied to circuits EL7.a</p>	<p>7.a.6.h: Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment.</p> <p>7.a.7.h: Describe personal safety precautions for working with electric and electronic devices electrical shock.</p>
<p>Wisconsin Common Career Technical Standards (WCCTS)</p>	
<p>Creativity, Critical Thinking, Communication and Collaboration (4C)</p>	
<p>4C1: Students will think and work creatively to develop innovative solutions to problems and opportunities.</p>	
<p>Develop original solutions, products, and services to meet a given need 4C1.a</p>	<p>1.a.7.h: Develop original ways to solve a given problem.</p> <p>1.a.8.h: Design a product or service that could fulfill a human need or desire.</p> <p>1.a.9.h: Apply past experiences to current problems in developing innovative solutions.</p>
<p>Work creatively with others to develop solutions, products, and services 4C1.b</p>	<p>1.b.7.h: Incorporate the skills and experiences of others to develop a new solution to a problem.</p> <p>1.b.8.h: Work as part of a team to design a product or service that could fulfill a human need or desire.</p> <p>1.b.9.h: Work as part of a team to improve an existing product or process.</p>
<p>4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.</p>	

<p>Develop effective resolutions for a given problem, decision or opportunity using available information 4C2.a</p>	<p>2.a.11.h: Determine the information needed to address an identified problem. 2.a.12.h: Contrast the benefits and drawbacks of various proposed resolutions to a given situation. 2.a.13.h: Predict how an action could result in unintended consequences, both positive and negative. 2.a.14.h: Analyze the impact of a decision using a systems thinking model. 2.a.15.h: Determine the best resolution for a problem, decision or opportunity based on given criteria. 2.a.16.h: Defend an action taken or a decision implemented.</p>
<p>Develop and implement a resolution for a new situation using personal knowledge and experience 4C2.b</p>	<p>2.b.5.h: Apply past experience to develop a course of action for a new situation. 2.b.6.h: Use existing knowledge to develop a resolution for a new situation, problem, or opportunity.</p>
<p>4C3: Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.</p>	
<p>Communicate thoughts and feelings with others using verbal and non-verbal language 4C3.a</p>	<p>3.a.9.h: Develop a mutually acceptable response to a question or problem. 3.a.11.h: Communicate effectively in the presence of a language barrier. 3.a.12.h: Utilize effective listening skills in creating consensus in a group.</p>
<p>Work collaboratively with others 4C3.b</p>	<p>3.b.7.h: Participate in group processes to generate consensus. 3.b.8.h: Lead group processes to generate consensus.</p>
<p>Use interpersonal skills to resolve conflicts with others in an ethical manner 4C3.c</p>	<p>3.c.7.h: Resolve conflicts productively with individuals as they arise. 3.c.8.h: Lead a team or group through a conflict resolution process to reach a productive outcome.</p>
<p>Career Development (CD)</p>	
<p>CD1: Students will consider, analyze, and apply an awareness of self, identity and culture to identify skills and talents.</p>	
<p>Identify person strengths, aptitudes, and passions CD1.a</p>	<p>1.a.3.h: Evaluate various occupations and career pathways to identify personal, academic and career goals based on personal strengths, aptitudes, and passions.</p>
<p>Demonstrate effective decision-making, problem solving and goal setting CD1.b</p>	<p>1.b.5.h: Use a decision-making and problem-solving model. 1.b.6.h: Develop an action plan to set and achieve realistic goals.</p>
<p>CD2: Students will identify the connection between educational achievement and work opportunities in order to reach personal and career goals.</p>	
<p>Assess attitudes and skills that contribute to successful learning in school and across the life span CD2.b</p>	<p>2.b.8.h: Assess education and training opportunities to acquire new skills necessary for career advancement.</p>

CD3: Students will create and manage a flexible and responsive individualized learning plan to meet their career goals.	
Examine and evaluate opportunities that could enhance life and career plans and articulate plans to guide decisions and actions CD3.b	3.b.5.h: Evaluate the relationship between educational achievement and career development.
Employ career management strategies to achieve future career success and satisfaction CD3.c	3.c.6.h: Discuss how adaptability and flexibility, especially when initiating or responding to change, contributes to career success.
CD4: Students will identify and apply employability skills.	
Demonstrate skills related to seeking and applying for employment to find and obtain a desired job CD4.b	4.b.6.h: Prepare a resume, cover letter, employment application.
Identify and exhibit traits for retaining employment CD4.c	4.c.4.h: Model behaviors that demonstrate reliability and dependability. 4.c.5.h: Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.
Environment, Health, and Safety (EHS)	
EHS1: Students will identify the importance and interrelationships of health, safety and environmental systems and evaluate the impacts of these systems on organizational performance for continuous improvement.	
Implement personal and jobsite safety rules and regulations to maintain and improve safe and healthful working conditions and environments EHS1.d	1.d.8.h: Identify different workplace systems that protect and enhance personal and environmental health and safety.

Key Vocabulary:			
AC Current	DC Current	Movement	Series Circuit
Ammeter	Diode	Ohmmeter	Transistor
Capacitor	Electromagnet	Parallel Circuit	Voltage
Conductor	Generator	Power	Voltmeter
Combination Circuit	Insulator	Resistance	
Current	Magnetism	Resistor	

Topics/Content Outline- Units and Themes:

Quarter 1:

- Electricity
 - Generating Electricity
 - Parts of Circuits
 - Types of Circuits
 - Measurable Electrical Terms (Ohm's Law)
 - Digital Multimeter Usage
 - Wiring Diagrams

Quarter 2:

- Electronics and Soldering
 - EKI Software – Electrical Components
 - Ohm's Law
 - Snap-Circuits
 - Soldering
 - Understanding Relays

Primary Resource(s):

Electricity & Electronics
Goodheart Wilcox
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