



# Career & Technology

## Digital Electronics

Unit 1 Fundamentals					
Academic Alignment with TEKS	CTE TEKS	Content/Vocabulary	Guiding Questions	Activities	Resources and Web links
<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A</p> <p><b>Math:</b> None</p>	<p><b>Lesson 1.1 Safety</b></p> <p>Students will be able to identify hazards in the lab and know locations of the safety equipment and how to use it.</p> <p>Students will understand the causes of and the dangers from electric shock and explain methods to prevent it.</p> <p>Students will understand that the process of designing an electronic circuit takes into account many factors, including environment concerns, and will be familiar with precautionary measures.</p>	<p>Current Ground Voltage</p>	<p>What types of injuries can occur in an electronics lab and how can they be prevented?</p> <p>How can you protect yourself from electric shock?</p>	<p>Evaluation 1.1A General Safety Test</p> <p>Evaluation 1.1B Soldering Safety Test</p>	<p>Example Material Safety Data Sheet</p> <p>PowerPoints:<sup>®</sup> Safety Soldering Safety Etching Safety</p> <p>Reference Sources: Tokheim, R. L., (1999). Digital electronics, Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02- 804161-5</p>
<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A §112.32.b.5</p> <p><b>Math:</b> None</p>	<p><b>Lesson 1.2 Electron Theory</b></p> <p>Students will be able to label the parts of the atom. Students will explain the relationship of quantum energy required to strip away electrons from atoms to being classified as an insulator or conductor. Students will be able to define and explain the difference between direct and alternating currents.</p>	<p>Alternating Current Atom Conventional Current Flow Direct Current Electron Electron Flow Neutron Nucleus Ordit Proton Quantum</p>	<p>How do protons, neutrons and electrons combine to form an atom?</p> <p>What is the only difference between a bolt of lightening and the spark that is seen between a person's hair and a hard rubber comb used in the hair on a dry day?</p> <p>What is the difference between alternating and direct current?</p>	<p>Activity 1.2A Basic Electron Flow</p>	<p>PowerPoints:<sup>®</sup> Electron Flow</p> <p>Reference Sources: Dugger, W. E. and Gerrish, H. H. (1994). Electronics technology. Goodheart-Wilcox Company, Inc., South Holland, IL. ISBN 0- 87006-085-6 Kaufman, M. and Wilson, J.A. (1973). Basic electricity: Theory and practice, McGraw-Hill Book Company, NY, NY. ISBN 0-07-033402-</p>



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					1. Mims, F. M. III, (1983). Getting started in electronics, Radio Shack, USA.
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<p>English: §110.32.b.1.b &amp; C</p>	<p><b>Lesson 1.4 Resistance</b></p> <p>Students will understand the material makeup of resistors and how they are used in circuit</p>	<p>Color Code Ohmmeter Resistor Fixed Resistor Ohm</p>	<p>How are all resistors the same and in what ways can they be different? In what way is a light</p>	<p>Activity 1.4 A Resistors</p>	<p>PowerPoints:<sup>®</sup> Resistance Digital Multimeter Reference Sources: Dugger, W. E. and</p>

<p>Science: §112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p>design. Students will understand the symbols associated with resistors. Students will be able to correctly setup lab equipment to measure resistor values in order to compare measured and rated values. Students will calculate the tolerance levels of various resistors to determine if the measured value is within specifications.</p>	<p>Schematics Multimeter Potentiometer Variable Resistor</p>	<p>bulb like a resistor?</p>		<p>Gerrish, H. H. (1994). Electronics technology. Goodheart-Wilcox Company, Inc., South Holland, IL. ISBN-0-87006-085-6 Protel International Limited (2000). CircuitMaker@2000 help files</p>
<p>English: §110.32.b.1.b &amp; C</p> <p>Science: §112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 1.5 Laws</b>  Students will be able to draw and label the parts of a simple circuit. Students will build and test a variety of series and parallel circuits, using simulation software and proto-boards, to prove the accuracy of Ohm's and Kirchhoff's laws. Students will correctly select and utilize electrical meters to determine voltage, resistance and current in simple circuits. Students will calculate the resistance, current and voltage in a circuit using Ohm's Law.</p>	<p>Closed Circuit Current Loop Ohm Ohm's Law Ohmmeter Open Circuit Resistance Short Circuit Source Voltage</p>	<p>How can one predict if a resistor will burn out? What does it mean for an electrical circuit to have a short? Where do the terms "current" and "flow" come from? What happens when an improper voltage is applied to a device such as a light bulb?</p>	<p>Activity 1.5A Circuits Activity 1.5B Ohm's Law Activity 1.5C Kirchhoff's Laws Activity 1.5D Series-Parallel Circuits</p>	<p>PowerPoints:<sup>®</sup> Basic Electrical Circuits Reference Sources: CircuitMaker@2000 help files, (2000). Protel International Limited. Dugger, W. E. and Gerrish, H. H. (1994). Electronics technology, Goodheart-Wilcox Company, INC South Holland, IL. ISBN 0-87006-085-6 Kaufman, Milton and Wilson, J.A. (1973). Basic electricity: theory and practice, McGraw-Hill Book Company, NY, NY. ISBN 0-07-033402-1 Mims, F. M. III. (1983). Getting started in electronics, Radio Shack, USA.</p>

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	<p><b>Lesson 1.7 Analog and Digital Waveforms</b></p> <p>Students will differentiate between digital and analog signals when given the waveforms.</p> <p>Students will wire and test a free-running clock circuits using a 555 timer.</p> <p>Students will calculate the output frequency of a clock circuits using observations and the oscilloscope.</p>	<p>Analog Digital Duty Cycle Fall Time Falling Edge Frequency Hertz High Leading Edge Low Oscilloscope Period Pulse Pulse Amplitude Pulse Width Rise Time Rising Edge Trailing Edge Waveform</p>	<p>What do analog and digital signals look like? Give several examples of quantities that are analog. Give several examples of quantities that are digital. What does the transistor have to do with Digital Electronics? Who invented the transistor? When? Why?</p>	<p>Activity 1.7A The Oscilloscope Activity 1.7B Analog and Digital Waveforms Activity 1.7C The Reaction Game</p>	<p>PowerPoints:<sup>®</sup> The Oscilloscope  Reference Sources  Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p>English: §110.32.b.1.b &amp; C</p>	<p><b>Lesson 1.8 Obtaining Data</b></p> <p>Sheets Students will successfully complete an internet search for data sheets for integrated</p>	<p>Amperage Data Sheet Ground Input Output Pin Numbers</p>	<p>What kinds of information can you obtain about an integrated circuit from its data sheet?</p>	<p>Activity 1.8A – Finding Data Sheets</p>	<p>PowerPoints:<sup>®</sup> N/A Reference Sources: N/A</p>



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<p>English: §110.32.b.1.b &amp; C</p> <p>Science: §112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 2.1 Number Conversions</b></p> <p>Students will understand numerical place value. Students use mathematical symbols to represent different bases and will communicate concepts using different number systems. Students will demonstrate the relationship of binary and hexadecimal to bits and bytes of information used in computers. Students will convert values from one number system to another.</p>	<p>Binary Bit Byte Decimal Hexadecimal Least Significant Bit (LSB) Most Significant Bit (MSB) Nibble Word</p>	<p>Why is the binary number system the primary system used in digital electronics? Why is it important to be able to convert between number systems? Why is being able to understand place value important to counting in different bases?</p>	<p>Activity 2.1A Binary to Decimal Activity 2.1B Decimal to Binary Activity 2.1C Hexadecimal to Binary Activity 2.1D Binary to Hexadecimal Activity 2.1E Hexadecimal to Decimal Activity 2.1F Decimal to Hexadecimal Unit 2 Assessment Number Systems Poster</p>	<p>PowerPoints:<sup>®</sup> Number Systems Reference Sources: N/A</p>
<p>English: §110.32.b.1.b &amp; C</p> <p>Science: §112.32.c.1.A</p> <p>Math:</p>	<p><b>Lesson 3.1 Logic Gates</b></p> <p>Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design problems. Students will identify the name, symbol, and function and create the truth table, and Boolean Expression for the basic logic gates through research and experimentation.</p>	<p>AND Binary Boolean Expression DIP Gate Ground High Inventor Low NAND NOR NOT Notch/Dot</p>	<p>How can electronic devices help make complex decisions? Why do you need to express a question mathematically? How can a complex gate be created to handle several inputs?</p>	<p>Activity 3.1A Basic Gates Activity 3.1A Wiring Diagrams Activity 3.1A Chart 1 Activity 3.1B Basic Gates Application Activity 3.1C Best Gate</p>	<p>PowerPoints:<sup>®</sup> Logic Gates Logic Waveforms Reference Sources: Bignell, J. W. and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Protel International Limited, (2000). CircuitMaker<sup>®</sup>2000</p>



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<p>§111.32.b.A.1 §111.32.b.A.5</p>	<p>Students will apply logic to design and create, using gates, solutions to a problem.</p>	<p>One OR Output Pin True or False Truth Table VCC Zero</p>			<p>help files. Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p>English: §110.32.b.1.b &amp; C</p> <p>Science: §112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 4.1 Boolean Expressions</b></p> <p>Students will recognize the relationship between the Boolean expression, logic diagram, and truth table.</p> <p>Students will be able to create Boolean Expressions, logic circuit diagrams or truth tables from information provided in the solution of design problems.</p> <p>Students will appropriately select the Sum-of-Products or the Product-of-Sums form of a Boolean Expression to use in the solution of a problem.</p>	<p>Boolean Algebra Boolean Expression Maxterm Minterm Product-of-Sums Sum-of-Products Truth Table`</p>	<p>How are a truth table, a logic circuit, and Boolean Algebra related?</p>	<p>Activity 4.1A Boolean Expressions from Logic Circuits</p>	<p>PowerPoints® Circuits and Boolean Expressions</p> <p>Reference Sources</p> <p>J. W., and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5</p> <p>T. L. (1997). Digital fundamentals (6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5</p> <p>International Limited (2000). Circuit Maker@2000 help files.</p> <p>m, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p>English: §110.32.b.1.b &amp; C</p>	<p><b>Lesson 4.2 Logic Simplification</b></p> <p>Students will apply the rules of Boolean algebra to logic diagrams and truth tables to minimize the circuit size</p>	<p>Associative Boolean Expression Combinational Logic Commutative Distributive Karnaugh Mapping Variable</p>	<p>Why is it advantageous for a circuit designer to use the least number of chips possible? Why do you think that the word “algebra” is in the phrase “Boolean</p>	<p>Activity 4.2A Logic Simplification Activity 4.2B DeMorgan’s Theorems Activity 4.2C Karnaugh Mapping</p>	<p>PowerPoints® Boolean Algebra Circuits and Boolean Expressions DeMorgan’s Theorem Karnaugh Map Method</p>



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<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A</p>	<p><b>Lesson 6.1 Binary Addition</b></p> <p>Students will demonstrate understanding of binary addition and subtraction by designing circuits to produce correct answers.</p> <p>Students will create and prove the truth table for both half and full adders.</p>	<p>Cascade 1's Complement 2's Complement Full Adder Half Adder Least Significant Bit Most Significant Bit Output Subtrahend XNOR XOR</p>	<p>How can a device that will add numbers be created? How are binary numbers added and subtracted mathematically? Can binary addition be done with the use of gates? How is binary addition</p>	<p>Activity 6.1 A Adding and Subtracting Binary Numbers Activity 6.1 B XOR and XNOR Gates Activity 6.1 C Complement Adder/Subtractor</p>	<p>PowerPoints® Binary Addition and Subtraction XOR &amp; XNOR Logic Gates Adder and Subtractor Design Reference Sources Bignell, J. W., and Donovan, R. L. (1958). Digital electronics.</p>

<p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p>Students will design, construct and test adder circuits using both discrete gates and MSI gates.</p>		<p>done with the use of an MSI device?</p>		<p>Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Floyd, T. L. (1997). Digital fundamentals (6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5 Protel International Limited (2000). Circuit Maker@2000 help files. Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
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<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A</p>	<p><b>Lesson 7.3 Triggers</b></p> <p>Students will understand the different types of triggers used by latches and flip-flops and select the appropriate one for the circuits they design.</p> <p>Students will analyze timing</p>	<p>Edge Triggered Falling Edge Master/Slave Negative Edge Positive Edge Rising Edge Trigger</p>	<p>What are the four parts of an input pulse that can trigger a latch or a flip-flops output? How do each of the triggers work?</p>	<p>Activity 7.3A Flip-Flop Triggers</p>	<p>Reference Sources Bignell, J. W., and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Floyd, T. L. (1997). Digital fundamentals</p>

<p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p>diagrams that reflect triggering to identify distinguishing characteristics.</p>				<p>(6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5 Protel International Limited (2000). Circuit Maker@2000 help files. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2 Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p>English: §110.32.b.1.b &amp; C</p> <p>Science: §112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 7.4 Flip-Flop Design Considerations</b></p> <p>Students will conduct experiments with clock pulse width to determine the effect on the accuracy of data transmission.</p>	<p>Clock Pulse Width Propagation Delay Trigger</p>	<p>Why is it important to be aware of a problem that could occur with a circuit design before beginning to plan or actually build a circuit?</p>	<p>Activity 7.4A FF Timing Considerations</p>	<p>Reference Sources Bignell, J. W., and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Floyd, T. L. (1997). Digital fundamentals (6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5 Protel International Limited (2000). Circuit Maker@2000 help files. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2 Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-</p>



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<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A</p> <p><b>Math:</b> §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 7.5 Applications of Flip-Flops</b></p> <p>Students will assemble circuits and compile information about the various applications of flip-flops.</p>	<p>Clock Debouncing Frequency Latch Positive Edge Propagation Delay Waveform</p>	<p>Where are memory devices used? List at least 10 examples.</p>	<p>Activity 7.5A Elementary Applications of Flip-Flops Unit7 Evaluation</p>	<p>Reference Sources Bignell, J. W., and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Floyd, T. L. (1997). Digital fundamentals (6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5 Protel International Limited (2000). Circuit Maker®2000 help files. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2 Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A</p> <p><b>Math:</b></p>	<p><b>Lesson 8.1 Shift Registers</b></p> <p>Students will conduct experiments to determine the basic principles of how shift registers work.</p> <p>Students will evaluate the use of shift registers in product design and the speeds at which those products run.</p>	<p>Clock Parallel Data Transfer Serial Data Transfer</p>	<p>What are the two principle functions of shift registers and how do they work? Why would it be an advantage to transfer information serially as opposed to using a parallel output? Other than a calculator, what devices use shift registers? Name at</p>	<p>Activity 8.1A Shift Registers</p>	<p>PowerPoints® Shift Registers</p> <p>Reference Sources Bignell, J. W., and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Floyd, T. L. (1997). Digital fundamentals (6th ed.), Prentice Hall,</p>



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<p>§111.32.b.A.1 §111.32.b.A.5</p>			<p>least 5.</p>		<p>Englewood Cliffs, NJ. ISBN 0-13-398488-5 Protel International Limited (2000). Circuit Maker@2000 help files. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2 Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A</p> <p><b>Math:</b> §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 8.2 Asynchronous Counters</b></p> <p>Students will create a circuit using discrete flip-flops to discover the operation and characteristics of asynchronous counters.</p> <p>Students will design, simulate, build, and test Mod counters using discrete gates in the solution to a design problem.</p> <p>Students will design, simulate, build, and test asynchronous Mod counters using an integrated counter chip (MSI).</p>	<p>Asynchronous Cascade Clear Counter Mod Modulus Preset Reset Ripple Counter Toggle</p>	<p>Why are asynchronous counters known as ripple counters? What timing issues should a designer know about when using counters based on asynchronous logic?</p>	<p>Activity 8.2A Discrete Asynchronous Counters Activity 8.2B Modulus Asynchronous Counters Activity 8.2C Integrated Asynchronous Counters Activity 8.2D Modulus Integrated Asynchronous Counters</p>	<p>PowerPoints® Asynchronous Counters</p> <p>Reference Sources Bignell, J. W., and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Floyd, T. L. (1997). Digital fundamentals (6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5 Protel International Limited (2000). Circuit Maker@2000 help files. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2 Tokheim, R. L. (1999). Digital electronics.</p>

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<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b> §112.32.c.1.A</p> <p><b>Math:</b> §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 8.3 Synchronous Counters</b></p> <p>Students will design, simulate, build, and test synchronous Mod counters using discrete gates to solve a problem.</p> <p>Students will design, simulate, build, and test synchronous Mod counters using an integrated counter chip in the solution to a design problem.</p>	<p>Clock Count Down Count Up Modulus Propagation Delay Synchronous Toggle</p>	<p>What benefits are there to a designer and to a manufacturer to use Integrated chips rather than discrete ones? How do propagation delays affect the operation of a counter, both synchronous and asynchronous? How is a synchronous counter different from an asynchronous counter?</p>	<p>Activity 8.3A Discrete Synchronous Up/Down Counters Activity 8.3B Synchronous Mod Counters Activity 8.3C Integrated Synchronous Counter Activity 8.3D Integrated Synchronous Up/Down Counter Activity 8.3E Counter Design Problem based on Lesson Anticipatory set Activity 8.3F Design Problem</p>	<p>PowerPoints® Synchronous Counters Up/Down Counters</p> <p>Reference Sources Bignell, J. W., and Donovan, R. L. (1958). Digital electronics. Delmar Publishers, Albany, NY. ISBN 0-8273-5743-5 Floyd, T. L. (1997). Digital fundamentals (6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5 Protel International Limited (2000). Circuit Maker®2000 help files. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2 Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p><b>English:</b> §110.32.b.1.b &amp; C</p> <p><b>Science:</b></p>	<p><b>Lesson 9.1 Families and Specifications</b></p> <p>Students will be able to interpret the graphs, charts, and written materials contained in a data sheet and apply it to a design problem.</p>	<p>CMOS Data Sheet Fan-Out Logic Families Noise Open Collector Schottky TTL</p>	<p>Where can information be obtained to give specifications about integrated circuits? What specifications can make a difference in the performance of a circuit?</p>	<p>Activity 9.1A Propagation Delay Activity 9.1B Fan-Out and Noise</p>	<p>PowerPoints® The Oscilloscope Device Specifications and Logic Families</p> <p>Reference Sources Floyd, T. L. (1997). Digital fundamentals</p>

<p>§112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p>Students will be able to correctly setup and use an oscilloscope to observe and measure propagation delay in a digital circuit.</p> <p>Students will be able to define, calculate, and measure noise margin, drive capabilities, fan-out and propagation delay.</p> <p>Students will be able to list safety precautions for handling CMOS chips.</p>	<p>Voltage</p>			<p>(6th ed.), Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-398488-5 Tokheim, R. L. (1999). Digital electronics. Glencoe McGraw-Hill Publishers, New York, NY. ISBN 0-02-804161-5</p>
<p>English: §110.32.b.1.b &amp; C</p> <p>Science: §112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p><b>Lesson 10.1 Microcontrollers</b></p> <p>Students will be able to formulate a flow chart to correctly apply basic programming concepts in the planning of a project.</p> <p>Students will be able to design and create a program, using correct syntax, to evaluate data and make decisions based on information gathered from the environment using external digital and analog sensors.</p> <p>Students will create an interface to allow them to inspect, evaluate and manage program parameters in the microprocessor during the operation of a program.</p>	<p>Branching Cadmium Sulfide Cell Debug Flow Chart For/Next Goto Input Loop Machine Language Output Phototransistor Potentiometer Program Sequential Logic Switch Syntax Thermistor Variable</p>	<p>What are the basic blocks of a Microprocessor? How is a microprocessor programmed?</p>	<p>Activity 10.1A – Flowcharts Activity 10.1B – Debug Screen Activity 10.1C – Declaring Outputs Activity 10.1D – Declaring Inputs Activity 10.1E – Output as Sound Activity 10.1F – Analog Inputs</p>	<p>PowerPoints® The Basic Stamp Introduction to Pbasic Programming</p> <p>Reference Sources Kuhnel, C. and Zahnert, K. (2000). Basic stamp (2<sup>nd</sup> ed.), Newnes, Boston MA. ISBN 0-7506-7245-5 Parallax® Inc. (1998). Basic stamp programming manual. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2</p>
<p>English: §110.32.b.1.b &amp; C</p>	<p><b>Lesson 10.2 Interfacing with Motors</b></p> <p>Students will be able to design and create a program in correct</p>	<p>Commutator H-Bridge Horsepower MOSFET Optocoupler</p>	<p>How does one interface devices such as a microcontroller with a motor or other heavy current device</p>	<p>Activity 10.2A Interfacing with a Motor Activity 10.2B Motor with H-</p>	<p>Reference Sources Kuhnel, C. and Zahnert, K. (2000). Basic stamp (2<sup>nd</sup> ed.), Newnes, Boston MA.</p>



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<p>Science: §112.32.c.1.A</p> <p>Math: §111.32.b.A.1 §111.32.b.A.5</p>	<p>syntax allowing a microprocessor to evaluate external data in order to operate motors and other devices to control the external environment.</p> <p>Students will appropriately select, size, and implement interface devices to control external devices.</p>	<p>PLC PWM (Pulse width Modulation) Relay Rotor Solid State Relay Stator Stepper Motor Thyristor</p>	<p>which might have different voltage requirements? How does a printer know where to put the ink and how does the head move to that position?</p>	<p>Bridge Driver Activity 10.2C Stepper Motors</p>	<p>ISBN 0-7506-7245-5 Parallax<sup>®</sup> Inc. (1998). Basic stamp programming manual. Scherz, P. (2000). Practical electronics for inventors, McGraw-Hill, New York. ISBN 0-07-058078-2</p>
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