Digital Electronics

Michigan Grades 9-12 Technology Standards Linked	Unit 1 Fundamentals: Students will be able to identify hazards in the lab and know locations of the safety equipment and how to use it.	Students will understand the causes of and the dangers from electric shock and explain methods to prevent it.	Students will understand that the process of designing an electronic circuit takes into account many factors, includin	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 classi	Students will learn how to apply Kirchhoff's voltage and current laws to closed loops.	Students will be able to define and explain the difference between direct and alternating currents.	Students will be able to re-write any number using conventional prefix definitions.	Students will understand the material makeup of resistors and how they are used in circuit 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 an	Students will calculate the tolerance levels of various resistors to determine if the measured value is within specifica	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 p	Students will correctly select and utilize electrical meters to determine voltage, resistance and current in simple circ	Students will calculate the resistance, current and voltage in a circuit using Ohm's Law.	Students will describe the component parts of a capacitor and describe how a capacitor holds a static charge.	Students will use and understand the units of measurement for capacitors.	Students will be able to calculate the value of capacitors mathematically and through the use of instrumentation.	Students will be familiar with different types of capacitors and their voltage polarity requirements.	Students will be able to draw a digital waveform and identify the anatomy of the waveform.	Students will differentiate between digital and analog signals when given the waveforms.	Students will wire and test a free-running clock circuits using a 555 timer.	Students will calculate the output frequency of a clock circuits using observations and the oscilloscope.
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Michigan Grades 9-12 Technology Standards Linked	Unit 10 Microprocessors: Students will be able to formulate a flow chart to correctly apply basic programming concepts in the planning of a p	Students will be able to design and create a program, using correct syntax, to evaluate data and make decisions ba	Students will create an interface to allow them to inspect, evaluate and manage program parameters in the micropr	Students will be able to design and create a program in correct syntax allowing a microprocessor to evaluate extern	Students will appropriately select, size, and implement interface devices to control external devices.	Students will design and create programming to control the position of stepper motors.	Unit 2 Number Systems: Students will understand numerical place value.	Students use mathematical symbols to represent different bases and will communicate concepts using different nur	Students will demonstrate the relationship of binary and hexadecimal to bits and bytes of information used in compu	Students will convert values from one number system to another.	Unit 3 Gates: Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design p	Students will identify the name, symbol, and function and create the truth table, and Boolean Expression for the bas	Students will apply logic to design and create, using gates, solutions to a problem.
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Michigan Grades 9-12 Technology Standards Linked	Unit 4 Boolean Algebra: Students will recognize the relationship between the Boolean expression, logic diagram, and truth table.	Students will be able to create Boolean Expressions, logic circuit diagrams or truth tables from information provided	Students will appropriately select the Sum-of-Products or the Product-of-Sums form of a Boolean Expression to use	Students will apply the rules of Boolean algebra to logic diagrams and truth tables to minimize the circuit size neces	Students will use DeMorgan's Theorem to simplify a negated expression and to convert a SOP to a POS and visa v	Students will formulate and employ a Karnaugh Map to reduce Boolean expressions and logic circuits to their simpl	The students will create circuits to solve a problem using NAND or NOR gates to replicate all logic functions.	The students will apply their understanding of the workings of NOR and NAND gates to make comparisons with sta	Unit 5 Boolean Algebra and Circuit Design: Students will restate and simplify a digital design problem as part of the systematic approach to solving a problem.	Students will design, construct, build, troubleshoot, and evaluate a solution to a design problem.	Students will present an oral report presenting a solution and evaluation of a design problem of their choice.	Students will discover the code to create numbers on a seven segment display by experimentation.	Students will design a circuit to control a seven segment display with a decimal to BCD encoder and a display drive	Students will control the flow of data by utilizing Multiplexers and Demultiplexers.	Students will be able to design and implement combinational logic circuits using reprogrammable logic devices.	Students will create PLD logic files that define combinational circuit designs using Boolean Expressions.	Students will understand and use logic compiler software to create JEDEC files for programming PLDs.	Students will demonstrate understanding of binary addition and subtraction by designing circuits to produce correct	Students will create and prove the truth table for both half and full adders.	Students will design, construct and test adder circuits using both discrete gates and MSI gates.
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Michigan Grades 9-12 Technology Standards Linked	Unit 6 Adding: Demonstrate understanding of binary addition and subtraction by designing circuits to produce correct answers.	Create and prove the truth table for both half and full adders.	Design, construct and test adder circuits using both discrete gates and MSI gates.	Unit 7 Flip-Flops: Students will construct and test simple latches and flip-flops from discrete gates.	Students will interpret, design, draw, and evaluate circuits using the logic symbols for latches and flip-flops.	Students will be able to interpret waveform diagrams from circuits they construct and compare them with combinatio	Students will compare and contrast operation of synchronous with asynchronous flip-flop circuits they construct.	Students will be able to create and interpret timing diagrams and truth tables for J-K Flip-Flops.	Students will understand the different types of triggers used by latches and flip-flops and select the appropriate one	Students will analyze timing diagrams that reflect triggering to identify distinguishing characteristics.	Students will conduct experiments with clock pulse width to determine the effect on the accuracy of data transmissi	Students will assemble circuits and compile information about the various applications of flip-flops.
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