Minnesota
Articulated College Credit (ACC) Agreement
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Agreement Name: **<u>Digital Electronics</u>**

Agreement Last Reviewed: **Fall 2023**
Next Review Date: **Fall 2025**

College Courses			
Class	**Title**	**School**	**Credits**
MECA 1250	Mechatronics Systems Operations I	South Central College	2.0 of 3.0

Curriculum Content Objectives

To receive credit, students will meet 100% of the following content objectives:

1. **Describe Digital Electronics**
   a. Identify characteristics of digital circuits
   b. Identify characteristics of linear (analog) circuits
   c. Describe the different types of multivibrators
   d. Analyze simple logic-level indictor circuits
   e. Demonstrate the basic operation of several lab instruments

2. **Examine Number Systems**
   a. Describe the idea of place value in the decimal, binary, octal and hexadecimal number system
   b. Convert binary number to decimal and decimal numbers to binary
   c. Convert hexadecimal numbers to binary, binary to hexadecimal, hexadecimal to decimal, and decimal numbers to hexadecimal
   d. Convert octal numbers to binary, binary to octal, octal to decimal, and decimal numbers to octal
   e. Use terms such as bit, nibble, byte, and word when describing data groupings

3. **Examine Logic Gates**
   a. Memorize the name, symbol, truth table, function and Boolean expression for the eight basic logic gates
   b. Draw logic diagrams
   c. Convert basic gates to other logic functions using inverters
   d. Troubleshoot simple logic gate circuits

4. **Combine Logic Gates**
   a. Draw logic diagrams from minterm and maxterm Boolean expressions
   b. Design a logic diagram from a truth table
   c. Reduce a minterm Boolean expression to its simplest form using Karnaugh maps
   d. Identify the fundamentals of Programmable Logic Devices (PLDs)

5. **Explain the inputs and outputs for basic logic gates, sequential logic circuits, and combinational**
   Circuits
   a. Draw the logic symbol for the inverter, and, or, nor, xor and xnor logic gates
   b. Identify the function of the inverter, and, or, nor, xor and xnor logic gates
   c. Explain the function of a basic RS flip-flop and explain its primary variations to include D, JK and latch
   d. Describe the operation of both an asynchronous and synchronous counter
   e. Generalize the loading (data in) and unloading (data out) of a shift register
   f. Identify the schematic symbols for encoders, decoders, multiplexers and comparators
   g. Explain the applications for combinational logic circuits

6. **Practice basic troubleshooting techniques**
   a. Use isolation techniques to verify and eliminate problems in a circuit
   b. Understand the common types of defects for both hard-wired and PCB circuits
   c. Read a schematic diagram
   d. Use basic trouble shooting tools, such as meters, documentation and effective notes

7. **Utilize various test equipment, to include the multimeter, logic probe and function generator**
   a. Connect a digital multimeter into a circuit to measure resistance, voltage and current
   b. Use a logic probe to determine the operation of digital circuits
   c. Explain the various functions and purposes for inputting signals using a function generator

8. **Build a final project that includes logic gates, sequential logic circuits, and combinational logic circuits**
   a. Read a digital electronics schematic that includes sequential and combinational logic circuits
   b. Breadboard a moderately complicated digital elections circuit onto a breadboard
   c. Test and report the results of a digital circuit

9. **Acquire skills to allow effective teamwork**
   a. Accept responsibility to complete projects as part of a team, not only as an individual
   b. Build, test, demonstrate and report on a capstone project as part of a team
   c. Foster a learning environment by helping all team members maintain an equal level of competence
   d. Adjust to team member's learning style, especially during lab experiment

Assessments

Students must achieve no less than 80% or B for a final grade in the high school course to receive ACC.

ACC Concept

Through Articulated College Credit (ACC), specific college curriculum content goals and assessments are embedded in participating high school career and technical education (CTE) programs as specified in this agreement. Relevant knowledge, skills, and standards are taught by qualified CTE high school instructor(s) in one or more high school course. ACC is awarded if the student meets the college equivalency standards and later enrolls in the college(s) listed requiring the course in a specific program.