



**COWLEY COLLEGE  
& Area Vocational Technical School**

**COURSE PROCEDURE FOR**

**DIGITAL ELECTRONICS  
MEC3481 3 CREDIT HOURS**

**Student Level:**

This course is open to high school and post-secondary level students.

**Catalog Description:**

**MEC 3481 - DIGITAL ELECTRONICS (3 hrs)**

The student will analyze, construct, test, and interface fundamental digital circuits including logic gates, combinational logic circuits, flip-flops, counters, encoders and decoders, shift registers, arithmetic circuits, digital to analog conversions, and analog to digital conversions. The student will also demonstrate knowledge of numbering systems and integrated circuit specifications.

**Prerequisites:**

None

**Controlling Purpose:**

This course is designed to help the student increase their knowledge regarding fundamentals of manufacturing digital electronics.

**Learner Outcomes:**

Upon completion of the course, the student will be able to demonstrate a proficiency in practical skills required to design and troubleshoot actual digital circuitry that they will see on the job.

The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

**Units Outcomes and Criterion Based Evaluation Key for Core Content:**

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

**Evaluation Key:**

A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.

Rev: 6/01/2016

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- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.
- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

<b>UNIT 1: Number Systems and Codes</b>						
Outcomes: Upon completion of this course students will be able to accurately translate between number coding systems.						
A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Determine the weighting factor for each digit position in the decimal, binary, octal, and hexadecimal numbering systems.
						Convert any number in one of the four number systems to its equivalent value in any of the remaining three numbering systems.
						Describe the format and use of binary-coded decimal numbers.
						Determine ASCII code for any alphanumeric data by using the ASCII code translation table.

## UNIT 2: Digital Electronic Signals and Switches

Outcomes: Upon completion of this course students will be able to successfully understand solid state relay activities.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe the parameters associated with digital voltage-versus-time waveform.
						Convert between frequency and period for a periodic clock waveform.
						Sketch the timing waveform for any binary string in either the serial or parallel representation.
						Discuss the application of manual switches and electromechanical relays in electric circuits.
						Explain the basic characteristics of diodes and transistors when they are forward circuits.
						Calculate the output voltage in an electrical circuit containing diodes or transistors operating as digital switches.
						Perform input/output timing analysis in electric circuits containing electromechanical relays or transistors.
						Explain the operation of a common emitter transistor circuit used as a digital inverter switch.

## UNIT 3: Basic Logic Gates

Outcomes: Upon completion of this course students will be able to successfully understand gate functionality.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe the operation and use of gates.
						Construct truth tables for various gates.
						Describe the operation, using timing analysis.
						Draw timing diagrams.
						Explain how to use a logic pulser and a logic probe to troubleshoot digital integrated circuits.

#### UNIT 4: Programmable Logic Devices

Outcomes: Upon completion of this course students will be able to successfully apply gate logic to basic designs and standards.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Explain the benefits of using PLDs.
						Describe the PLD design flow.
						Understand the differences among PAL, SPLD, PLA, CPLD, and FPGA.
						Interpret the output of a simulation file to describe logic operations.
						Interpret VHDL code for the basic logic gates.

#### UNIT 5: Arithmetic Operations and Circuits

Outcomes: Upon completion of this course students will be able to successfully apply gate logic to mathematical functions.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Perform four binary arithmetic functions.
						Convert positive and negative numbers to signed two's-complement notation.
						Explain the design and operation of a half-adder and a full-adder circuit.
						Explain the function of an arithmetic/logic.

**UNIT 6: MultiSIM**

Outcomes: Upon completion of this course students will be able to successfully understand IC chip applications.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Utilize an IC magnitude comparator to perform binary comparison.
						Describe the function of a decoder and an encoder.
						Utilize manufacturers' data sheets to determine the operation of IC decode and encoder chips.
						Describe the function and uses of multiplexers and de-multiplexers.
						Design circuits that employ multiplexer and de-multiplexer.

**Projects Required:**

As assigned

**Textbook:**

Contact Bookstore for current textbook.

**Materials/Equipment Required:**

None

**Attendance Policy:**

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

**Grading Policy:**

The grading policy will be outlined by the instructor in the course syllabus.

**Maximum class size:**

Based on classroom occupancy

**Course Timeframe:**

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum

Rev: 6/01/2016

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of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

**Refer to the following policies:**

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

**Disability Services Program:**

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability, which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.