



**MERCER**  
COUNTY COMMUNITY COLLEGE

## COURSE OUTLINE

<b>Course Number</b> EET 251	<b>Course Title</b> Digital Circuit Fundamentals	<b>Credits</b> 4
<b>Hours:</b> Lecture/Lab/Other 3 Lecture/3 Lab	<b>Pre-requisite</b> EET 130 or EET 139	<b>Implementation Semester &amp; Year</b> Spring 2022

**Catalog description:**

Introduces the basic theory, concepts and devices behind digital circuitry and computers, including gates, registers, flip-flops, counters, decoders and encoders, half- and full adders, and clocks. The electrical characteristics, limitations, and connections of digital integrated circuit packages are explored. Corresponding labs reinforce lecture materials through practical examples.

**General Education Category:**

Not GenEd

**Course coordinator:**

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**Required texts & Other materials:**

Digital Systems: Principals and Applications by Gregory Moss, Ronald Tocci, Neal Widmer, Pearson/Prentice Hall, ISBN: 978-0-13-422013-0

Experiments in Digital Fundamentals by David M. Buchla, Pearson/Prentice Hall, ISBN-13: 978-0-13-712965-2

**Course Student Learning Outcomes (SLO):**

***Upon successful completion of this course the student will be able to:***

1. Describe the operations of any of the basic building blocks of a digital circuit, including the various gates, adder/subtractor circuits, flip-flops, counters and registers. [ILG # 1, 2, 3; PLO # 1, 6]
2. Describe component parameters using a datasheet. [ILG # 1, 10, 11; PLO # 1, 6]
3. Design a digital logic circuit given input and output conditions, and reduce the circuit if necessary. [ILG # 2, 3, 4, 10, 11; PLO # 6]
4. Work with fellow students to properly wire, test and troubleshoot basic digital components and circuits given a schematic diagram and/or datasheet. [ILG # 1, 4, 10, 11; PLO # 1, 3, 6, 8]

**Course-specific Institutional Learning Goals (ILG):**

**Institutional Learning Goal 1. Written and Oral Communication in English.** Students will communicate effectively in both speech and writing.

**Institutional Learning Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**Institutional Learning Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

**Institutional Learning Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Institutional Learning Goal 10. Information Literacy:** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

**Institutional Learning Goal 11. Critical Thinking:** Students will use critical thinking skills understand, analyze, or apply information or solve problems.

## **Program Learning Outcomes for Electronics Engineering Technology (PLO)**

1. Communicate effectively in English, both orally and in written form.
3. Work as a team with fellow workers.
6. Demonstrate an understanding of fundamental digital circuits.
8. Set up and operate modern electronic equipment such as DMM, oscilloscope, and signal generators.

## **Units of study in detail – Unit Student Learning Outcomes:**

### **Unit I      **Number Systems, Codes and Gates** [Supports Course SLO #1, 2, 3, 4]**

#### **Learning Objectives**

##### ***The student will be able to:***

1. Count in the binary, octal, decimal and hexadecimal number systems.
2. Convert between the binary, octal, decimal and hexadecimal number systems.
3. Identify the seven basic logic gates and describe their operation. Identify each gate's truth table and Boolean expression.
4. Express the truth table and Boolean equation for a given logic circuit.
5. Convert AND/OR gate to its equivalent using DeMorgan's Theorem.
6. Convert basic text to ASCII code and ASCII code to basic text given the ASCII code chart.
7. Properly wire a TTL IC into a circuit using the datasheet or pin-out diagram for that device and a schematic wiring diagram.

### **Unit II      **TTL Device Characteristics, Boolean Algebra, Karnaugh Maps and Arithmetic Logic Units** [Supports Course SLOs # 1, 2, 3, 4]**

#### **Learning Objectives**

##### ***The student will be able to:***

1. Identify the operating characteristics of a TTL device given a datasheet including pinout, power dissipation, input/output voltage range, current parameters, and propagation delay.
2. Differentiate between a commercial and a military TTL IC.
3. Identify the various series of devices within the TTL family of devices (regular TTL, Schottky, low powered Schottky, etc.).
4. Describe the flow of current (sinking and sourcing) between interconnected TTL gates based on the output condition of the driving gate.
5. Properly implement a sum of products circuit given the desired input and output conditions.
6. Build a reduced logic circuit using Boolean algebra and/or Karnaugh maps given the truth table for the circuit.

**Unit III**      **Flip-flops, Registers and Counters** [Supports Course SLOs # 1, 2, 4]

**Learning Objectives**

***The student will be able to:***

1. Describe the operation of a flip-flop circuit in terms of the devices propagation delay time, hold time and setup times.
2. Wire a flip-flop, register or counter into a circuit using a datasheet and/or schematic wiring diagram.
3. Draw a timing diagram for an RS latch, D latch or JK flip-flop.
4. Describe the operation of a register given its datasheet.
5. Identify the basic types of counters.

**Evaluation of student learning:** [Evaluates SLOs # 1 - 4]

Students' achievement of the course objectives will be evaluated through the use of the following:

- Three unit tests assessing students' comprehension of terminology, calculations and practices related to the unit objectives.
- Lab grade based on individual reports of experimental results.
- Homework.

<b>Evaluation Tools</b>	<b>Percentage Of Grade</b>
3 Unit Tests	60%
Lab Experiments & Reports	20%
Homework	20%
<b>Total</b>	<b>100%</b>