
TITLE: DIGITAL CIRCUITS I  |  CREDITS: 3.0  |  CONTACTS: CLASS - LAB - TOTAL

PREREQUISITES: EEM 201

DESCRIPTION: This course is a study of the logic elements, mathematics, components, and circuits utilized in digital equipment. Emphasis is placed on the function and operation of digital integrated circuit devices.

TEXTBOOK(S) OR ALTERNATIVE: Digital Techniques by Heathkit, Textbook - Pdf and handouts will be given.

MATERIALS (specifying those to be purchased by student): Materials provided are course outline and lab equipment. Students will provide textbook, lab manual, paper, pencils, and a scientific calculator.

COLLATERAL READING: NONE

CLASS MANAGEMENT ACTIVITIES (Attendance, tardies, testing, etc.): 

Academic Dishonesty: Students are expected to do their own work. Please refer to the NETC Student Code and Grievance Procedure for definition of academic dishonesty and an outline of disciplinary action that may result therefrom.

Attendance: Students are expected to attend all scheduled classes, however, up to 10 hours of absence are allowed for unavoidable hardships such as illness or car trouble. A student missing more than 10 hours of class for any reason will be dropped from the course for excessive absences. A grade of "W" will be assigned if a student drops, or is dropped from a class prior to mid-term. After mid-term, a grade of "WF" is assigned unless there are extenuating circumstances and the student is passing the course at the time of withdrawal.

Tardies: A student is considered tardy if he or she arrives for class after the roll has been taken. Three tardies constitute 1 hour of absence.

Assigned Work: If a student is absent the day an assignment (test and/or homework) is due, he or she is required to complete the work on the first day back in class.

Classroom Etiquette: An integral part of an education is developing a sense of integrity and responsibility not only toward ourselves but also toward others. In the classroom, as on the job or in your home, exhibiting appropriate behavior reflects on your maturity. Arriving on time to class, being prepared, and
considerate of others as they are talking has a positive effect on others. Please be considerate.

**Student ID:** It is mandatory that every student wear his or her student ID at all times. During the first week of classes, the instructor will issue a reminder to wear the ID. This reminder is a warning.

Then instructors are required to dismiss students without ID from class. The student may get his/her ID (or a new one from Student Services for $3.00) and return to class before the midpoint of the class. If the student cannot get his/her ID and return to class by the midpoint, the instructor will record the absence.

**DISABILITIES STATEMENT:**
Students with disabilities are encouraged to contact the Dean of Student Services to discuss needs or concerns as they pursue an academic program and participate in campus life. The Dean of Student Services will provide guidance regarding official documentation of disabilities and/or accommodation of needs. (See College Catalog)

**RESOURCES (A-V, persons, tools/equipment):**
- Lab manual: Digital Techniques student workbook;
- Videotapes: Digital Techniques by VTR;
- Trainer: ET 3200; and a parts kit.

**COURSE TOPICAL OUTLINE** (List topics and sub-topics of course) and Calendar or approximate length of time devoted to topic.

**UNIT 1** INTRODUCTION TO DIGITAL TECHNIQUES (5 HRS)
- a. Binary Number System
- b. Binary Codes
- c. Data Representation
- d. Video #1 "Introduction to Digital Techniques"

**UNIT 2** SEMICONDUCTOR DEVICES FOR DIGITAL CIRCUITS (7 HRS)
- a. Transistor Switch
- b. Transistor Inverter
- c. MOSFET
- d. Video #2 "Transistor Operations"
- e. Video #3 "Bipolar Switch/MOSFET"
- f. Experiment #1 in Student Workbook

**UNIT 3** DIGITAL LOGIC CIRCUITS (7 HRS)
- a. Inverter
- b. AND/OR
- c. NAND/NOR
- d. Video #4 "Digital Logic Circuits"
- e. Experiments #2, 3, and 4 in Student Workbook
UNIT 4 DIGITAL INTEGRATED CIRCUITS (7 HRS)
   a. Logic Circuit Characteristics
   b. Integrated Circuits
   c. TTL, ECL, and MOS
   d. Video #5 "Logic Circuit Characteristics"
   e. Video #6 "TTL/ECL Logic Circuits"
   f. Video #7 "MOS/TTL Logic Circuits"
   g. Experiments #5 and 6 in Student Workbook

UNIT 5 BOOLEAN ALGEBRA (pages 5-1 to 5-50) (7 HRS)
   a. Truth Tables
   b. Boolean Rules
   c. Minimizing
   d. Video #8 "Boolean Algebra Basics"
   e. Video #9 "Boolean Rules"
   f. Experiments #7 and 8 in Student Workbook

UNIT 6 FLIP-FLOPS AND REGISTERS (7 HRS)
   a. Flip-Flops
   b. D-Type
   c. J-K Type
   d. Video #10 "Latch/D-type Flip-flop and Registers"
   e. Video #11 "J-K Flip-flop"
   f. Experiments #9, 10 and 11 in Student Workbook

UNIT 7 SEQUENTIAL LOGIC CIRCUITS (7 HRS)
   a. Counters
   b. Shift Registers
   c. Clocks
   d. Video #12 "SLC Binary Counters"
   e. Video #13 "SLC BCD & Special Counters"
   f. Video #14 "SLC Shift Registers"
   g. Video #15 "SLC Clocks"
   h. Experiments #12, 13, 14, 15, 16, and 17 in Student Workbook

UNIT 8 COMBINATIONAL LOGIC CIRCUITS (7 HRS)
   a. Decoders
   b. Multiplexers
   c. ROM
   d. Video #16 "CLC Decoders/Encoders/Multiplexers"
   e. Video #17 "CLC Exclusive or/Code Converters"
   f. Video #18 "CLC ROMs and PLAs"
   g. Experiments #18, 19, 20, 21, and 22 in Student Workbook

UNIT 9 SEMICONDUCTOR MEMORIES (7 HRS)
   a. Memory Types
   b. Read/Write
   c. PROM
   d. Video #19 "SM Memory Basic"
   e. Video #20 "SM Read/Write Memories"
   f. Video #21 "SM Dynamic/PROM Memories"
UNIT 10  DATA CONVERSION  (7 HRS)
   a.  Digital-to-Analog
   b.  Analog-to-Digital
   c.  Video #22 "DC Digital-to-Analog"
   d.  Video #23 "DC Analog-to-Digital"

UNIT 11  DIGITAL TROUBLESHOOTING  (7 HRS)
   a.  Typical Problems
   b.  Procedures
   c.  Video #24 "Digital Test Instruments"
   d.  Video #25 "Digital Troubleshooting"

STUDENT LEARNING OUTCOMES:  Upon completion of this course the student will have demonstrated the ability to:

1.  Use drawings and schematics to describe equipment.
2.  Identify other numbering systems beside the decimal system.
3.  Convert between the decimal, binary, and Octal numbering system.
4.  Analyze logic circuits using AND, OR, NAND, NOR, and Inverter logic symbols and construct their truth tables.
5.  Construct simple circuits using the basic logic gates.
6.  Trace signals through the basic logic gates, R-S, J-K and D flip-flop counters and registers.

INSTRUCTIONAL METHODS TO COMPLETE OUTCOMES:  Classroom lectures, demonstrations, videotapes, textbook assignments and lab experiments.

EVALUATIVE METHODS TO APPRAISE OUTCOMES:  Approximately ten unit tests will be given. The unit average will constitute 80% of the course grade with 20% assigned to labs.

GRADING SCALE:

90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
Below 60 = F