

2010/2011 Digital Electronics I
PTE309 - 18 weeks
DoDEA Course Description and Competencies

About the Program

Digital Electronics prepares students for careers in the Science, Technology, Engineering & Mathematics industries. The course sequence focuses on duties and tasks performed by professionals in engineering and technology as well as pre-employment and employment skills.

Major Concepts/Content: The Digital Electronics course familiarizes students with the theories, skills and technologies involved in electronics circuits and digital technology. Students will develop the technical skills necessary to continue follow-on course work in microprocessors other engineering courses. They will study electronic theory, electronic components, circuit analysis, digital number systems, logic gates and circuits, and Boolean algebra.

Major Instructional Activities: Instructional activities will provide students with hands-on experiences using digital components and electronic circuits. Students will perform laboratory experiments and construct projects studying the properties of electricity and electronic devices while using electronic components, number systems, and logic circuits.

Major Evaluative Techniques: Students will be required to conduct laboratory experiments and complete laboratory safety and content tests. Circuit construction projects and experiments will be compared to base-line plans for evaluation. Written and oral reports will be evaluated for content and form. Class participation will also be evaluated.

The table below is a competency list for the Digital Electronics I course. The competencies are considered essential and are required of all students.

PTE309 18 weeks	Digital Electronics I TASKS/COMPETENCIES
Implementing DoDEA's CTE Course Requirements	
• 001	Demonstrate DoDEA's Workplace Readiness Skills in course activities.
• 002	Identify issues related to this field of study that affect the environment and impact local and global communities.
• 003	Identify Internet safety issues and procedures for complying with acceptable use standards.
Safety	
• 004	Identify hazards in the lab and know locations of the safety equipment and how to use it.
• 005	Identify the causes of and the dangers from electric shock and explain methods to prevent it.
Basic Electronic Theory	
• 006	Label the parts and associated charges of the atom.
• 007	Describe the quantum difference between materials considered to be conductors, semiconductors, and insulators.
• 008	Describe the "electron flow" theory and law of charges.
• 009	Define and explain the difference between direct and alternating currents.
• 010	Describe the different methods of producing electricity.

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Circuit Laws	
• 011	Draw and label the parts of a simple circuit.
• 012	Build series, parallel, and series-parallel circuits comparing calculated values with measured values.
• 013	Use electronic test equipment to measure voltage, current, and resistance.
• 014	Calculate resistance, current and voltage using Ohm's Law.
• 015	Calculate voltage and current using Kirchhoff's laws.
Identify Passive Devices and Their Operation	
• 016	Describe resistor and capacitor construction and how they work.
• 017	Draw schematic symbols associated with resistors and capacitor.
• 018	Describe resistance and capacitance units of measure.
• 019	Use electronic test equipment to measure resistance and continuity.
• 020	Calculate resistor tolerance and compare with the measured value.
• 021	Compare the indicated and measured values of capacitors.
• 022	Describe the differences between electrolytic and electrostatic capacitors.
Identify Active Devices and Their Operation	
• 023	Describe semiconductor construction how they work.
• 024	Identify the schematic symbols associated with bipolar, diodes, thyristors, and transistors.
• 025	Use electronic test equipment to test diodes, thyristors, and transistors.
• 026	Build a circuit that demonstrates the operation of diodes, thyristors, and transistors.
Magnetism and DC Motors	
• 027	Describe the properties of magnets and magnetism.
• 028	Describe the properties of inductance and self/mutual induction.
• 029	Construct and test a basic DC motor.
Analog and Digital Waveforms	
• 030	Describe the difference between digital and analog signals.
• 031	Diagram a digital waveform identifying its parts.
• 032	Construct a working free-running clock oscillator circuit.
Number Systems – Conversions	
• 033	Determine place value in the decimal, binary, and hexadecimal number systems.
• 034	Represent numbers using engineering notation and SI prefix.
• 035	Explain why computers use the binary number system.
• 036	Convert values from one number system to another.
Logic Gates	
• 037	Use schematic symbols and Boolean Algebra to represent logic gates and simple logic circuits.
• 038	Derive the truth table, Boolean expression, and function of various logic gates.
• 039	Design and construct a circuit to solve a logic problem.
Boolean Algebra and Expressions	
• 040	Recognize the relationship between a Boolean expression, logic circuit, and truth

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	table.
• 041	Create Boolean Expressions from logic circuit diagrams and truth tables.
Specific Application Mid-Scale Integration (MSI) Gates	
• 042	Determine the pin-out for a seven-segment display.
• 043	Build a BCD to seven-segment driver circuit.
• 044	Demonstrate how multiplexers and demultiplexers work.
Binary Addition	
• 045	Design a logic circuit that adds and subtracts binary numbers.
• 046	Use logic gates to construct half and full adder logic circuits.
Introduction to Sequential Logic	
• 047	Construct and test simple latches and flip-flops from logic gates.
• 048	Analyze sequential logic circuit diagrams.
The Flip-Flop	
• 049	Compare and contrast synchronous and asynchronous flip-flop circuits.
• 050	Interpret timing diagrams and truth tables for flip-flop circuits.
Triggers	
• 051	Apply triggers to latch and flip-flop circuits to solve design problems.
Shift Registers	
• 052	Describe the basic operations of shift registers.
• 053	Construct various shift register circuits.
Asynchronous Counters	
• 054	Use flip-flops to construct an asynchronous counter.
• 055	Use discrete gates to construct an asynchronous Mod counter.
• 056	Use MSI chips to construct an asynchronous Mod counter.
Synchronous Counters	
• 057	Use flip-flops to construct a synchronous counter.
• 058	Construct synchronous MOD counters using discrete gates and MSI chips.
Logic Families	
• 059	Interpret a component data sheet and apply it to a design problem.
• 060	Describe handling precautions for CMOS devices.
• 061	Determine voltage requirements for TTL, MOS, and CMOS logic families.
Circuit Construction Techniques	
• 062	Identify tools commonly used in electronics and describe their proper use.
• 063	Perform various types of wire splices.
• 064	Solder wires to terminals, and components to printed circuit boards (PCB).
• 065	Use various methods to desolder components.
• 066	Complete and test a circuit construction project.
Enhancing Career Exploration and Employability Skills	
• 067	Conduct a job search.
• 068	Create or update a portfolio containing representative samples of student work.