Digital Electronics

Course Description:

Digital Electronics is the third course in the Electronics pathway. This course provides students with opportunities to apply their prior learning in electronics to the digital world. Students will engage in hands-on activities to develop functional devices and working prototypes, using computer simulations to aid their designs. The course emphasizes applications of mathematics and science in predicting the success of engineered solutions.

Prerequisites:

- Successful completion of Foundations of Electronics
- Successful completion of Advanced AC & DC Circuits

Classroom Procedures:

Entering the Classroom:

- Enter the classroom quietly take out your composition notebook and record the days Learning Target, Essential Question, and Agenda. ***(No food, drinks, or phones)***.
- Gather necessary materials for the days lesson and hang all bags on the back of the chair that you are occupying. ***(Specific materials will be highlighted on the Energy Systems White Board)***.
- Begin work on opening exercise quietly.

Exiting the Classroom:

- Secure all classroom equipment and place in assigned area.
- Ensure that your area is clean and clear before leaving. ***(This includes computer workstations that you were utilizing or other assigned spaces)***.
- Turn-in classroom assignments to appropriate physical or digital drop box.
- Return to your assigned seat until the bell rings and you are dismissed by the instructor.

Disciplinary Actions: *The order and type of consequences depend on the nature and severity of the infraction.*

- Verbal Warning
- Lunch Detention and phone call home. *(Minor Infractions)*.
- Counselor Referral.
- Discipline Referral. (*Major and Chronic Disciplinary Infractions)*.

Course Objectives:

1. Analyze characteristics of digital and analog systems.
2. Demonstrate the use of names, symbols, truth tables, and Boolean expressions for basic logic gates.
3. Utilize digital codes and convert between decimal numbers and letters to codes.
4. Determine flip-flop modes of operation and outputs using truth tables and waveforms.
5. Design and analyze counters and understand their real-world applications.
6. Create block-style logic diagrams for parallel adder and subtractor circuits.
7. Identify and characterize common memory and storage devices in microcomputer systems.
8. Understand the systems, components, and processes of technological systems.
9. Evaluate the impact of technology on global, economic, environmental, and societal contexts.
10. Develop leadership and interpersonal problem-solving skills through co-curricular activities.

Standards:

- **SCSh3:** Students will identify and investigate problems scientifically.
- **SCSh6:** Students will communicate scientific investigations and information clearly.
- **SCSh7:** Students will analyze how scientific knowledge is developed.
- **SCSh8:** Students will understand important features of the process of scientific inquiry.
- **MM3P1:** Students will solve problems using appropriate technology.
- **MM3P3:** Students will communicate mathematically.
- **MM3P4:** Students will make connections among mathematical ideas and to other disciplines.
- **MM3P5:** Students will represent mathematics in multiple ways.
- **ELAALRC3:** Students acquire new vocabulary in each content area and use it correctly.
- **ELAALRC4:** Students establish a context for information acquired by reading across subject areas.

Academic Standards Integration:

- **Science**: Understanding energy forms, Newtonian physics, quantum mechanics, and relativity.
- **Mathematics**: Computation and estimation skills, problem-solving, mathematical connections.
- **ELA/Literacy**: Reading, writing, and discussion skills relevant to technical subjects.

Topics Breakdown and Units of Study:

Unit 1: Introduction to Digital and Analog Systems

- Differentiate between digital and analog systems
- Identify and convert between numbering systems used in digital electronics
- Apply Boolean concepts to simplification processes

Unit 2: Basic Logic Gates

- Identify AND, OR, NOT, NOR, NAND, exclusive OR, and exclusive NOR gates
- Identify practical TTL and CMOS logic gates
- Identify IEEE logic symbols
- Discuss simplification techniques

Unit 3: Digital Codes

- Define and discuss 8421 BCD, Excess-3, and ASCII codes
- Explain encoders/decoders and displays

Unit 4: Flip-Flop Circuits

- Discuss RS, D, and JK flip-flop circuits
- Explore IC Latches and Schmitt Triggers
- Identify IEEE logic symbols

Unit 5: Counters

- Discuss ripple, synchronous, down, and self-stopping counters
- Explain frequency dividers and shift registers
- Apply counting to real-world events

Unit 6: Adders and Subtractors

- Discuss adders, subtractors, and binary multiplication
- Design and draw block-style logic diagrams for parallel adder and subtractor circuits

Unit 7: Memory and Storage Devices

- Fundamentals of memory and storage devices
- Discuss RAM, Static RAM, ROM, and PROMs
- Explore non-volatile read/write memory

Unit 8: Technological Systems

- Recognize the systems, components, and processes of technological systems
- Describe core concepts of technology
- Identify relationships among technologies and their connections to contemporary issues

Unit 9: Impact of Technology

- Describe the social, economic, and environmental impacts of technological processes, products, or systems
- Demonstrate ethical and professional behavior in technology development and use
- Explain the influence of technology on history and contemporary issues

Unit 10: Leadership and Teamwork

- Develop leadership and interpersonal problem-solving skills through participation in co-curricular activities with the Technology Student Association
- Demonstrate effective communication skills
- Participate in teamwork to accomplish specified organizational goals
- Demonstrate cooperation and understanding with persons who are ethnically and culturally diverse

Assessment Methods:

Major Grades= 40% Minor Grades= 60% Total= 100%

- Classwork/Homework = Minor
- Quizzes = Minor
- Exams = Major
- Papers/Presentations/Debates = Major
- Projects & Engineering Notebook = Major

Late Assignments: Late work/assignments are defined as, “assignments that are submitted after the specific deadline”.

- Late assignments may result in scores being reduced by 5% per school day for a 25% maximum reduction (five school days).
- Late work submitted after the fifth school day will **NOT** be accepted.
- Repeated incidents of late work may result in a teacher-student-parent conference to examine and correct the student’s work habits through an academic contract.

Resources:

- Textbook: Digital Electronics

- Scientific journals and articles
- Online databases and tools
- Guest speakers from the energy industry

Materials:

- 5 Composition Notebooks
- Pens or Pencils
- Wired Headphones with 3.5mm jack
- 2-3” Binder (Engineering Notebook)
- Loose Leaf Paper (College Rule OK)

This syllabus aims to provide a comprehensive overview of the Digital Electronics course, ensuring students gain practical skills and theoretical knowledge applicable to modern digital systems.

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Student Printed Name

_____
Student Signature and Date

_____
Parent Printed Name

_____
Parent Signature and Date

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