James Clemens High School
11306 County Line Road
Madison, AL 35756

Phone: 256-216-5313
Extension: 95119
Email: aeepperson@madisoncity.k12.al.us

Course Syllabus

Digital Electronics Fall 2022
Instructor: Allison Epperson

Dear Parent/Guardian,

Welcome to Digital Electronics!

My name is Allison Epperson and I will be your student's DE teacher this semester. It is my second year at JC, and I am so happy to be teaching DE again! At the end of this class, your student will have experience with building circuits in simulation, as well as physically on breadboards, and by soldering. It is my favorite class to teach! If you have any questions or concerns at any point during the semester, please feel free to reach out to me. Please submit this page of the syllabus on Schoology by Friday, August 5th.

Thank you,
Allison Epperson

My child and I have read and discussed the classroom syllabus.

Student Name (Print) _____ Date _____

Student Signature _____ Date _____

Parent/Guardian Name (Print) _____ Date _____

Parent/Guardian Signature _____ Date _____

Email Address(es) _____

Phone number(s) _____ _____ _____
Cell Home Work

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Course Description: Digital Electronics is a course of study in applied digital logic. Students will be introduced to digital circuits found in video games, watches, calculators, digital cameras, and thousands of other devices. Students will study the application of digital logic and how digital devices are used to control automated equipment. The use of digital circuitry is present in virtually all aspects of our lives, and its use is increasing rapidly. This course is similar to a first semester college course and is an important course of study for a student exploring a career in engineering or engineering technology.

Pre-Requisites:
Introduction to Engineering Design
Geometry
Co-Requisites:
Algebra II with Statistics or Algebra II with Trigonometry
Credentialing:
Students become familiar with Multisim and Multisim Live software, as well as National Instruments hardware and software.

Grading and Assessment: Test grades will account for 70% of the 9-weeks grade, with the remaining 30% being determined by quiz/daily grades. The grading scale is as follows: A (90-100%), B (80-89), C (70-79), D (65-69), and F (below 65). Grades will be a reflection of mastery of the standards. Make sure all absences are excused as class work can be made up and graded for excused absences only. The final exam counts for 20% of the final grade.
Not all assignments will be graded, but students must complete all work. Students will take notes via guided notes, graphic organizers, and other methods in this course. If a student is absent, their missed printed materials will be located in their class folder. Students are responsible for checking this folder AND Schoology when absent.
Students complete pre-tests in most units for participation grades and post-tests for accuracy test grades.

Professionalism Points Procedure:
- Students get 5 professionalism points a week in the TEST category. Students are subject to lose them if they break classroom procedures or rules. I can take 1 or all of them away, depending on the offense.
- Generally, if students are respectful and behave, this is nothing to worry about.

Late Work: Per JCHS Policy. All late work is to be submitted within 7 days of absence. Students must submit their late work online to the proper Schoology Assignment AND submit a "Late Work Form" Submission to receive credit. The late work form is checked every 2 weeks and student grades are updated then.

TSA (Technology Student Association) CTS Integration: Technology Student Association is a National Career Technical organization where students can use knowledge gained from Engineering courses. JCHS's team competes at Alabama TSA convention every year and students from this course can choose to register and attend.

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Embedded Numeracy Anchor Assignment: A main component of this course is to prepare students for everyday engineering practices. One of these practices is learning to write in engineering notation. During the first week of class, students will use their knowledge of scientific notation learned in earlier math classes to learn how to write answers in engineering notation. They will then use engineering notation throughout the semester to write any answer that is given in numerical form.

Embedded Literacy Anchor Assignment: Learning to conduct proper research in engineering databases is an essential skill learned in this class. In one assignment, students will use engineering databases to research integrated circuits and their functions. These integrated circuits are used in many assignments, including the midterm project, the Birthday Problem.

Accommodations: Requests for accommodations for this course or any school event are welcomed from students and parents.

Turnitin Notice: The majority of writing assignments in this course will be submitted to Turnitin via the Schoology learning platform. The primary focus of this software is to help students become better writers and scholars. Turnitin generates a report on the originality of student writing by comparing it with a database of periodicals, books, online content, student papers, and other published work. This program will help students discern when they are using sources fairly, citing properly, and paraphrasing effectively - skills essential to all academic work.

Students will have the opportunity to review their Turnitin originality report and will have the opportunity to make revisions before submitting their work for grading. Once their work is submitted, teachers have the opportunity to view the student's originality report and grade accordingly.

Supplies:

School Chromebook	Provided Engineering Paper
1.5 in binder	Pencils

Procedures

My Rules:

- Rules and Procedures will be discussed on the first day of class, but the main rules are as follows.

1. ALWAYS TREAT OTHERS WITH RESPECT. WE DO NOT MAKE OFFENSIVE JOKES IN CLASS.
2. DO NOT THROW THINGS ACROSS THE ROOM.
3. DO NOT WASTE VEX MATERIALS.
4. DO NOT SPEAK OVER ME WHEN I AM TEACHING.
5. DO NOT LEAVE MATERIALS OR YOUR THINGS ON MY TABLES WHEN YOU LEAVE.

Any breaking of rules can result in deduction of professionalism points.

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Technology in the Classroom:

- Bring your school Chromebook or personal computer and charger EVERY DAY. WE WILL USE IT EVERY DAY.
- You should know when it is appropriate to use your phone and when it is not.
- No phones out during presentations, but you can use them for quick googling.
    - CONSEQUENCE: I have phone jails to give you. If you get one, you must wrap your phone in it and tape it shut until the end of class.

Computer/Internet Appropriate Use Policies: Student laptops should not be hard-wired to the network or have print capabilities. 2. Use of discs, flash drives, jump drives, or other USB devices will not be allowed on Madison City computers. 3. Neither the teacher, nor the school is responsible for broken, stolen, or lost laptops. 4. Laptops and other electronic devices will be used at the individual discretion of the teacher.

Instructional Delivery Plan

18 Week Plan*		
Week	**Section(s)**	**Topic**
Week 1	1.1.0	Introduction
Week 2	1.1.3-1.1.5	Notation/ Analog / Circuit Theory
Week 3	1.1.5-1.1.9	Breadboarding/ Digital Components/Soldering (RNG)
Week 4	1.2.1-1.2.4	Combinational Logic/ Binary/ Counters
Week 5	1.2.5-1.2.7	Timers/ Random Number Generator
Week 6	2.1.1-2.2.2	Logic Expressions
Week 7	2.1.3-2.1.6	AOI Logic/ Majority Vote
Week 8	2.2.1-2.2.5	Karnaugh Mapping/ Universal Gates/ Fireplace Control
Week 9	2.2.5-2.3.2	Fireplace Control/ Seven Segment Display
Week 10	2.4.1-2.4.3	The Birthday Problem
Week 11	3.1.1-3.3.3	Flip-Flops
Week 12	3.2.1-3.2.2	Asynchronous Counters
Week 13	3.2.2-3.3.3	Asynchronous Counters/ Synchronous Counters
Week 14	3.3.3-3.3.4	Sixty-Second Timer
Week 15	4.1.1-4.1.3	Copier Jam Detector/ State Machines
Week 16	4.1.3-4.2.2	Tollbooth
Week 17	4.2.2-4.24	Tollbooth
Week 18		Review/Final Exam

*** This syllabus serves as a guide for both the teacher and student; however, during the term it may become necessary to make additions, deletions or substitutions.**

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Course Goals/ Objectives

Course Knowledge
• Foundations in Electronics
• Introduction to safety, electricity, and components
• Introduction to common analog and digital circuit designs and applications
• Combinational Logic
• Designing AOI combinational logic circuits
• Alternative Design: Universal gates and K-mapping
• Specific combinational logic designs
• Introduction to PLD design and circuit prototyping on a PLD
• Sequential Logic
• Sequential logic circuit design
• D flip-flops, J/K flip-flops, and flip-flop applications
• Asynchronous counters
• Counter design SSI, MSI, and MOD asynchronous counters
• Synchronous counters
• Counter design SSI, MSI, and MOD synchronous counters
• Controlling Real World Systems
• Introduction to state machines
• Introduction to sensors, motors, and state machine design
• Introduction to microcontrollers

Tools and Software
• Oscilloscope
• DMM
• FPGA Digital Mini System
• Digital Logic Board

Practical Application Experience
• Solder and de-solder components to printed circuit boards
• Validate circuit design through measurement using a probe/oscilloscope and analysis of timing diagram
• Select and apply the most appropriate technology for circuit implementation
• Implement designs on an FPGA
• Create a program to manage inputs and outputs of a microcontroller
PLTW Engineering

Professional Skills
• Team collaboration
• Project management
• Problem-solving
• Communication skills
• Presentation skills
• Technical writing

Digital Electronics Design Experience
• Implement the design process to design a circuit
• Design a circuit to meet voltage, current, or resistance design requirements
• Select components in a design to produce a desired waveform
• Implement the best combinational logic circuit design
• Apply knowledge of logic gates to select an appropriate gate for the circuit design
• Troubleshoot the design of a circuit by analysis and comparison to the truth table
• Implement a circuit design based on logic expressions
• Troubleshoot existing circuits based on logic expressions
• Determine when NAND only or NOR only implementations are the most efficient
• Implement a seven segment display into a circuit design
• Determine when a common cathode or common anode seven segment display may perform better in a particular circuit design
• Design a sequential circuit
• Describe the function of XOR/XNOR gates in a circuit design
• Design an adder/subtractor circuit related to the carry out and use on XOR gates
• Design a desired frequency of a clock signal in a 555 timer design
• Design a sequential logic circuit to produce a desired output
• Design synchronous/asynchronous counter circuits based on design requirements
• Design a state machine based on specific design requirements
• Design a circuit with motors as outputs that operate at different voltage levels
• Select and apply the most appropriate design method for circuit implementation

Computational and Analytical Skills
• Use mathematical processes to convert any value between any number systems
• Calculate voltage, current, and/or resistance for components in a complex circuit
• Translate circuit designs, truth tables, design requirements into logic expressions
• Simplify circuits using Boolean algebra theorems and DeMorgan's theorems
• Simplify a logic expression graphically using the Karnaugh Mapping process