



Digital Electronics

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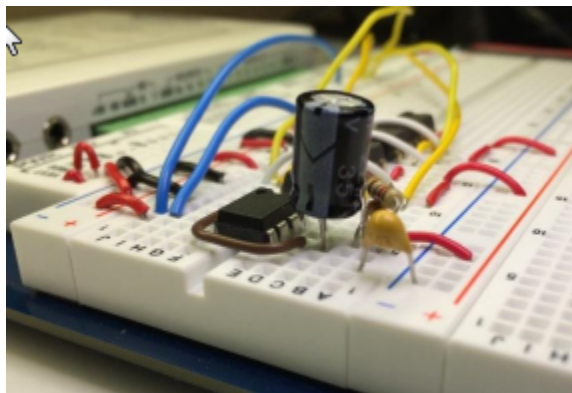
Course Description

Digital Electronics (DE) is the study of electronic circuits that are used to process and control digital signals. In contrast to analog electronics, where information is represented by a continuously varying voltage, digital signals are represented by two discrete voltages or logic levels. This distinction allows for greater signal speed and storage capabilities and has revolutionized the world of electronics. Digital electronics is the foundation of all modern electronic devices, such as cellular phones, MP3 players, laptop computers, digital cameras, and high-definition televisions.

The major focus of the DE course is to expose students to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards, and technical documentation.

Unit 1 – Foundations in Electronics

In Unit 1, Foundations in Electronics, students explore the fundamental components, concepts, equipment, and skill sets associated with circuit design. They learn an engineering design process that can be used to guide the creation of circuits based on a set of design requirements. Throughout the course, students learn about advancements in circuits and circuit design that have shaped the world of digital electronics.



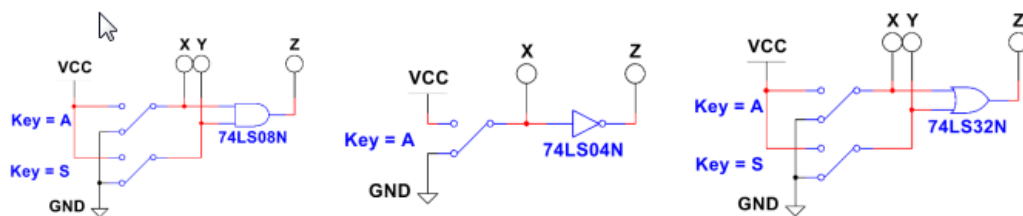
555 Timer Circuit



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Unit 2 – Combinational Logic

How do you design a circuit to “do what you want it to do”? The goal of Unit 2 is for students to gain in-depth understanding of the combinational-logic circuit design. Students explore creation of circuits with discrete components and how to simplify these circuits to implement more efficient designs.

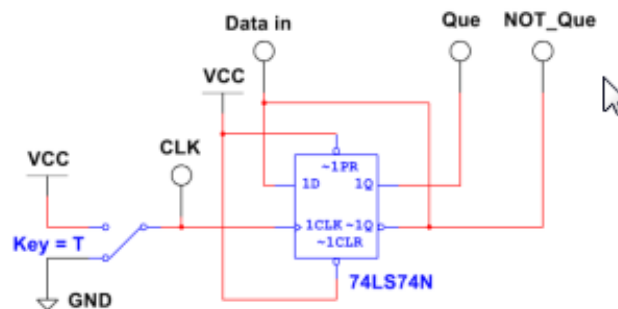


Combinational Logic Gates

Unit 3 – Sequential Logic

How do you get a circuit to “do what you want it to do, when you want it to do it”? Sequential logic introduces students to event detection and memory. Sequential logic has two characteristics that distinguish it from combinational logic. First, sequential logic must have a signal that controls the sequencing of events. Second, sequential logic must have the ability to remember past events.

A keypad on a garage-door opener is a classic example of an everyday device that uses sequential logic in the keypad, the sequencing signal controls when a key can be pressed. The requirement to enter the passcode in a specific order necessitates memory of past events. These characteristics are made possible by a simple device called a flip-flop. The flip-flop is a logic device that is capable of storing a logic level and allowing this stored value to change only at a specific time. For this reason, the flip-flop is the fundamental building block for all sequential-logic designs.



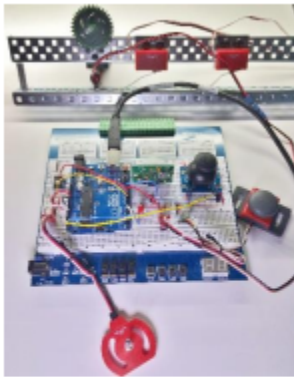
D Flip-Flop



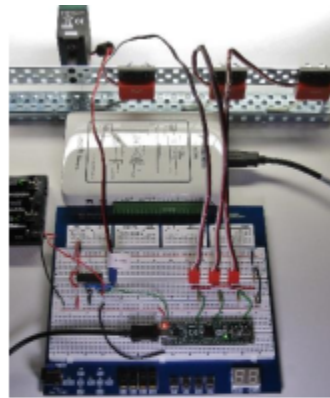
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Unit 4 – Controlling Real-World Systems

The goal of this unit is to apply the course concepts to a capstone problem. Students have the opportunity to apply the knowledge and skills learned in this and previous engineering courses to a capstone problem. Student teams choose a product to manufacture. Students break down the processes from simulated raw material to finished product. Students design, build, and program a manufacturing system model with the same prototyping system used earlier in the course.



Copier-Jam-Detector Problem



Sensors, Motors, and Microcontrollers

Rules and Expectations

- All school rules apply in this classroom. Please refer to your student handbook.
- You are to be inside the classroom when the bell rings, at your desk and working on the bell ringer.
- No bullying. No exceptions. Have and show respect for yourself, for the school, for me and for your fellow classmates. Be polite and use appropriate language.
- Be prepared. Bring materials to class every day. This includes a pencil, notebook AND your iPad.
- Be honest and do your own work. Integrity will get you further than cheating.
- Have a positive attitude and take ownership of your learning.
- Have only digital electronics materials on your desk during class.

The third violation of any classroom rule or school policy will result in a teacher detention. Subsequent violations will result in an office referral.



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Start of Class

Upon arrival, there will be a bell ringer projected on the screen that you will complete on Canvass with your iPad. You will have 3 minutes to complete this and submit it. This will be graded every day. In-class attentiveness and participation is vital to be successful in this class. You must remain engaged and not interfere with the learning of anyone else in the class. Class periods will end with an exit ticket.

Electronics Policy

iPads are to be used during class only for educational purposes when permitted to do so. Under no circumstances should students be checking messages, playing games or texting during class. Keep cell phones in your pocket/purse. I do not want to see them in class.

Grading Policy: Late assignments, Absences and Make-up Work

Bell ringers are graded daily and will be 10% of your grade. Homework and in-class work will comprise 30% of your grade. Labs and projects will account for another 30% of your grade. Quizzes and exams will make up the last 30%. Late assignments will be accepted up to five school days past the due date, after which a zero will be recorded in the grade book. A 50% penalty will be assessed on all late assignments. If absent, students have as many days to make up a quiz or test as the number of school days they missed. It is the students' responsibility to check with me when they return from an absence to check for missed work, notes, quizzes and tests. A zero will be given for any assignment if the student's absence is unexcused.

Extra Help

Digital circuits can be challenging, but the problem solving skills and real-world you learn in this classroom will benefit you no matter what career you end up in. To make sure that you are successful in this course, I will hold recitation sessions every Tuesday and Thursday from 2:30 to 3:00 for any student that wants help. Please take advantage of this and do not wait until you fall too far behind. I am more than willing to provide any extra help that you may need. If another time fits in better with your schedule, please let me know and we can arrange an alternative time. Stay current with the homework and ask for help whenever you encounter difficulties. I want you all to succeed.

Remind

I will be using a free app called Remind to send out general class announcements as well as homework and test reminders. There is an app you can download as well. I will give instructions and the class code during class.



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Academic Integrity

These standards have been adopted by the science department and will apply to all science classes.

- Try! Listen! Think!
- Be prepared for your class
- Use your iPad and phone for educational purposes only
- Do not get off task or give up
- Do not discuss test questions or answers
- Follow directions
- Be safe in the lab
- Do not cheat
- Do not damage school property

***Please keep the first two pages in your notebook and return only this signature sheet.**

I have read and understand the above information

Student name: _____

Student signature: _____

Parent or guardian name: _____

Parent or guardian signature: _____

Parents,

I will be contacting you at various times throughout the year with progress reports and updates regarding your child's standing in this class. Therefore, I need to know your email address and/or telephone number(s). Please also indicate the best time to call if I need to speak with you directly.

Email: _____

Telephone #: 1.) _____

2.) _____

Best time to call: _____