Lesson Planning Template   **Teacher: DeSIRE**

📅 Date:	Topic: Ultrasonic Devices	Time Required: 90 minutes

🎯 **Learning Target/Objectives:**
- I can explain about how ultrasonic waves are reflected and refracted
- I can explain how ultrasound technology is used in medical devices.
- I can identify a way ultrasound is used to help us in everyday life
- I can explain why there are different ways to measure with ultrasonic devices
- I can explain how an ultrasonic distance sensor measures distance

📜 **Vocabulary:**	❓ **Guiding Questions:**
- Wavelength - Reflection - Refraction - Ultrasonic/Ultrasound **Color Legend:** Red = Essential Blue = Enrichment Purple = In Depth	- How are ultrasonic devices used? What are their applications? - What limitations do ultrasonic devices have? - What are some everyday examples of ultrasonic technology?

📚 **Lesson Design Details:**
Activity 1:   https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/

Key Points:
- Advanced Manufacturing Connection - Electrical, mechanical, and computer engineers often use ultrasonic devices to measure and evaluate materials used in manufacturing and building to identify potential defects without destroying the product. This is a much safer and efficient approach than older scanning methods.

- This lesson is designed to engage students in an understanding of how ultrasonic sound is useful to us. It explains what ultrasonic devices are and gives examples of its uses. It also specifically shows the Elegoo HC-SR04 ultrasonic distance sensor. This lesson is connected to the associated activity Designing and Packaging a Distance-Sensing Product - where students use web editing software with the Elegoo HC-SR04 distance sensor and Arduino Microcontroller, Designing and Packaging a Distance Sensing Product.

📝 **Materials/Resources:**
- Digital Journal (Google Slides RECOMMENDED):
https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/

Reference Elegoo documents:

- Basic Starter Kit for UNO V1.0.2019.07.24.pdf
- https://www.teachengineering.org/lessons/view/mis-2227-ultrasonics-uses-arduino-ultrasound-technology
- https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/

📋 **Closing (Check for Understanding):**
- Discussion Review - students will share
  - Answers to Guiding Questions
  - Any surprises they experienced

Category	Standard Organization	Standard/Benchmark Code & Description
Science	**NCSCOS (Physical Science)**	**PSc.3.2.1:** Analyze the properties of waves, including frequency, period, amplitude, wavelength, and velocity
	NCSCOS (Physical Science)	**PSc.3.2.3:** Explain the interaction of waves with different media, specifically reflection and refraction.
	NCSCOS (Physical Science)	**PSc.3.2.4:** Summarize how instruments that transmit and detect waves (e.g., SONAR, medical imaging) are used in everyday life.
Technology	**ITEEA (STEL)**	**STEL-1B:** Explain the tools and techniques people use to help them do things, such as using transducers to replicate ultrasound frequencies.
	ITEEA (STEL)	**STEL-1M:** Analyze how technology and engineering are utilized in medical contexts, such as diagnostic imaging.
	ITEEA (STEL)	**STEL-8M:** Use specialized software and hardware (sensors) to access, organize, and communicate key ideas like distance measurement
Computer Science	**ISTE (Students)**	**1.1.d:** Students understand fundamental concepts of technology operations and demonstrate the ability to choose and use current technologies like ultrasonic sensors

| Mathematics | NCSCOS (Math) | **NC.M1.F-IF.4:** Interpret key features of graphs and tables in terms of the quantities, such as using time and speed to calculate distance |