10 Hydraulic Arm

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **4 Week**
Status: **Published**

General Overview, Course Description or Course Philosophy

This full-year course continues to emphasize the application of integrated STEM (Science, Technology, Engineering and Mathematics) principles and the design method introduced in the 1st year technology course. This course is taught on the foundations of technology education having students invent solutions to real-world problems through robotic applications. Students will identify problems, research, design and fabricate solutions. Problem solving, critical thinking and design skills are taught through various activities. Hands-on themes include structural and robotic systems, as well as system control technology. This course provides all students with valuable skills such as: problem solving, design, creative thinking, systems thinking, teamwork, documentation, programming, and computer applications.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

How to apply new and previously learned knowledge in order to design and build a hydraulic Arm, with specific requirements.

CONTENT AREA STANDARDS

TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CRP.K-12.CRP2	Apply appropriate academic and technical skills.

STUDENT LEARNING TARGETS

Students will understand:

- How hydraulics and pneumatics are used to increase power in a technological system.
- why air is considered a fluid

advantages and disadvantages of hydraulics vs pneumatics

● How to calculate mechanical advantage in the system

● How to design a system to produce a specific outcome

Declarative Knowledge

Students will know:

IDENTIFY and UNDERSTAND different types of end effectors and robotic arm components.

● List engineering log requirements.

● List orthographic drawing requirements.

● Identify the rules associated with lab, eye, and machine safety.

● Identify how to use safety equipment, hand tools, and all machines.

● Identify errors when processing material.

● Describe the proper technique for fluid power piston setup.

● Identify different types of fluid power.

● Define the purpose of different types of fluid power.

● Explain when and how to utilize different types of fluid power

● State the formula for calculating mechanical advantage in fluid power.

● Identify linkages and levers.

Procedural Knowledge

Students will be able to:

● Utilize a variety of methods to research possible solutions.

● Sketch, compare and contrast possible arm solutions.

● Develop a number of solutions, Select the best solution, and defend the rationale for the final chosen solution.

● Create and format an engineering log.

● Create and annotate an orthographic drawing.

● Select, rationalize, and calculate mechanical advantage.

● Apply knowledge of linkages and levers, and fluid power to design a robotic arm that can solve a real-world problem.

● Properly utilize lab tools and equipment to build the following systems: a base, joints, arms and end effector.

● Test the robotic arm and research methods to improve issues with: Power, friction, mechanical advantage, and others.

● Research, propose, and document what would happen if changes were made to the arm.

EVIDENCE OF LEARNING

Formative Assessments

Weekly log check(s).

Orthographic drawing check.

The mechanical advantage in fluid power check.

Structure/material processing check. Initial testing and evaluation.

Summative Assessments

Final Testing of Robotic Arm/Final Grading of Engineering Log

Unit Test

RESOURCES (Instructional, Supplemental, Intervention Materials)

Teacher notes on Engineering Logs.

Former student log examples.

Panasonic Challenge Engineering Log notes and examples.

INTERDISCIPLINARY CONNECTIONS

Educational Technology: Use of Google resources

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.