12 Crane

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **3 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 crane, 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

Declarative Knowledge

Students will know:

● 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 which production processes and equipment should be used to achieve a desired outcome.

● Identify errors when processing material.

● Describe how to properly set up a pulley system.

● Identify different types levers, gears and pulleys used.

● Define the purpose of different types of simple machines

● Explain when and how to utilize different types of simple machines.

● State the formula for calculating mechanical advantage.

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 levers, pulleys, and gears, to design a functional crane that can solve a real-world problem.

● Properly utilize lab tools and equipment to build the following systems: a structure, drivetrain, pulley system, cranking system, and storage container.

● Test the device and research methods to improve issues with Power, friction, mechanical advantage, etc.

● Research, propose and document what would happen if changes were applied to various systems within the project.

EVIDENCE OF LEARNING

Formative Assessments

Weekly log check(s).

Orthographic drawing check.

Drivetrain check.

Pulley system check.

Mechanical advantage in gears check.

Mechanical advantage in pulleys check.

Structure/material processing check.

Container check.

Initial testing and evaluation

Summative Assessments

Final Testing of Crane

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.