05 Lifting Mechanisms

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **8 Weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

This full year honors course continues to emphasize the application of integrated STEM (Science, Technology, Engineering and Mathematics) principles and the design method to 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 a variety of 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, team work, documentation, programming and computer applications.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

A lifting mechanism is any mechanism designed to move to perform tasks and/or lift objects. In competition robotics, there are three basic types of Lifting Mechanisms: Rotating Joints, Elevators, and Linkages. Students will identify different types of lifting mechanisms, then design and build an appropriate mechanism to solve a specific design problem.

CONTENT AREA STANDARDS

TECH.8.2.12.C.7	Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.
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.
TECH.8.2.12.D.CS1	Apply the design process.

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

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
LA.RH.11-12.8	Evaluate an author’s claims, reasoning, and evidence by corroborating or challenging them with other sources.

LA.RH.11-12.9	Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
LA.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- The appropriate use of materials (teflon vs. metal washers) must be incorporated in order to reduce friction in order for the system to work.
- A mechanical advantage must be incorporated utilizing gears or sprockets in order to increase the strength of larger lifts.
- The use of different motor gears may be incorporated in the lift system in order to increase mechanical advantage or system speed.
- The qualities of steel vs. aluminium and when/how to utilize the approprate material will determine the effectiveness of the system.
- They must incorporate a mechanical advantage utilizing gears or sprockets in order to increase system power.
- When designing/choosing a lift they need to consider how many degrees of motion are necessary to complete a task.
- Mechanical advantage of levers and motor output must be considered as the length of the lift arm increases.
- Keps-lock nuts and teflon spacers must be utilized in the lift system; proper tensioning of the keps-nut is required to keep the system secure and reduce friction.

Procedural Knowledge

Students will be able to:

- Use a design process to devise a technological product or system that addresses a global problem.
- Provide research in relation to the technological product or system.
- Identify trade-offs and constraints of a technological product or system.
- Document the process through drawings that include data and materials.
- 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.
- Apply the design process.

- Work productively in teams while using cultural global competence.
- Apply appropriate academic and technical skills.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text.
- Verify data when possible.
- Corroborate or challenge conclusions with other sources of information.
- Synthesize information from a range of sources
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
-
- Make sense of problems.
- Persevere in solving problems.
- Construct viable arguments.
- Critique the reasoning of others.
- Model with mathematics.

EVIDENCE OF LEARNING

Formative Assessments

Weekly engineering log checks; ability to follow design loop to design, evaluate and improve device performance.

Hands on activity observation.

Types of lilfts and lift terminology quizzes.

Summative Assessments

Final Engineering Log: Lift section

Final Lift Test

Lift performance competition test

Lift performance skills test

RESOURCES (Instructional, Supplemental, Intervention Materials)

VEX IQ Curriculum - Lifting Mechanisms

https://www.vexforum.com/

Teacher made handouts and tutorials available through Google Classroom/Suite

INTERDISCIPLINARY CONNECTIONS

ELA and Math as listed in related standards.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.