

# 05 Mechanical Advantage Gears

Content Area: **Technology**  
Course(s):  
Time Period: **Full Year**  
Length: **3 Week**  
Status: **Published**

## **General Overview, Course Description or Course Philosophy**

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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**

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Simple machines and basic mechanisms make life easier.

## **CONTENT AREA STANDARDS**

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

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CRP.K-12.CRP2	Apply appropriate academic and technical skills.
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## **STUDENT LEARNING TARGETS**

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## **Declarative Knowledge**

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Students will know:

- Identify different types of gears.
- Define the purpose of different types of gears.
- Explain when and how to utilize different types of gears.
- State the formula for calculating mechanical advantage.

How gears are used to increase power or speed in a technological system.

## **Procedural Knowledge**

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Students will be able to:

- Determine when to increase or decrease mechanical advantage in a system.
- Demonstrate the ability to design, build and apply gears in a system to increase or decrease mechanical advantage in order to solve a problem.
- Calculate the mechanical advantage of simple and complex (compound) gear systems.
- Calculate gear ratios for power and speed.
- Design and build simple and complex (compound) gear systems

## **EVIDENCE OF LEARNING**

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### **Formative Assessments**

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Observation of “Do Now”

mechanical advantage problems during and after lessons.

Observation of drivetrains designed and built by students.

Drawing of project drivetrain and how to calculate its MA.

Quiz on Mechanical Advantage.

Quiz on gear types, recognition and definitions.

### **Summative Assessments**

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Design project and engineering log - design and build a drivetrain to solve a real world problem; calculate mechanical advantage and explain rationale.

Include sketches, orthographic drawings, rationale, and how to improve. Questions on Unit Test following Rover Unit.

### **RESOURCES (Instructional, Supplemental, Intervention Materials)**

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Teacher notes on Engineering Logs.

Former student log examples.

Panasonic Challenge Engineering Log notes and examples.

### **INTERDISCIPLINARY CONNECTIONS**

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Educational Technology: Use of Google resources

### **ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS**

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See link to Accommodations & Modifications document in course folder.