

04 Power Transmission and Drivetrain

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

The robot subsystem which provides the ability to move is known as a drivetrain. In robotic drivetrains power is transmitted from a motor, through some sort of gear train, into a wheel, which applies force on the field surface to propel the robot forward. Students will use the design process to create a robotic drivetrain that can support multiple sub-systems, and will focus on reducing friction and increasing traction in order to move efficiently.

CONTENT AREA STANDARDS

TECH.8.2.12.C.6	Research an existing product, reverse engineer and redesign it to improve form and function.
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.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.

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.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
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.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- The design process is not linear.
- Reduction of friction in a drivetrain is dependant on many factors.
- The drivetrain must be able to support multiple sub-systems in order for the final design to be successful.
- They must continually evaluate and redesign throughout this unit in order to be successful (follow the design process).
- Creating an engineering log for data is an essential part of the design process.
- Communicating effectively with group members is required for group work.
- The structure of a robotic drivetrain must be strong and secure enough to house multiple sub-systems.
- Traction needs to be increased and friction must be nearly eliminated in order for the drivetrain to function properly.
- There are several different types of drivetrains that are applicable in robotic design and problem solving.
- The qualities of steel vs. aluminium and when/how to utilize the appropriate material.
- They must incorporate a mechanical advantage utilizing gears or sprockets in order for the system to work.

Procedural Knowledge

Students will be able to:

- Research an existing product.
- Reverse engineer and redesign an existing product to improve form and function.
- Use a design process to devise a technological product or system that addresses a global problem, provide research.
- Document the process through drawings that include data and materials.
- Design a prototype to solve a real world problem using a design process.
- Create a prototype to solve a real world problem using a design process.
- Identify constraints addressed during the creation of the prototype and trade-offs made.
- Present the solution for peer review.
- Use technology to enhance productivity.
- Work productively in teams while using cultural global competence.
- Apply appropriate academic and technical skills.
- Communicate clearly and effectively and with reason.
- Demonstrate creativity and innovation.
- Employ valid and reliable research strategies.
- Utilize critical thinking to make sense of problems and persevere in solving them.
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- 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.
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- 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.

Drivetrain terminology quiz.

Summative Assessments

Final Engineering Log: Drivetrain section

Final Drivetrain Test

Drivetrain performance competition test

Drivetrain performance skill test

RESOURCES (Instructional, Supplemental, Intervention Materials)

VEX EDR Curriculum: Unit 9 Drivetrain Design <https://curriculum.vexrobotics.com/curriculum/drivetrain-design.html>

<https://www.vexforum.com/>

Teacher made handouts and tutorials available through Google Classroom/Suite

INTERDISCIPLINARY CONNECTIONS

ELA and Mathematics as listed in related standards.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.