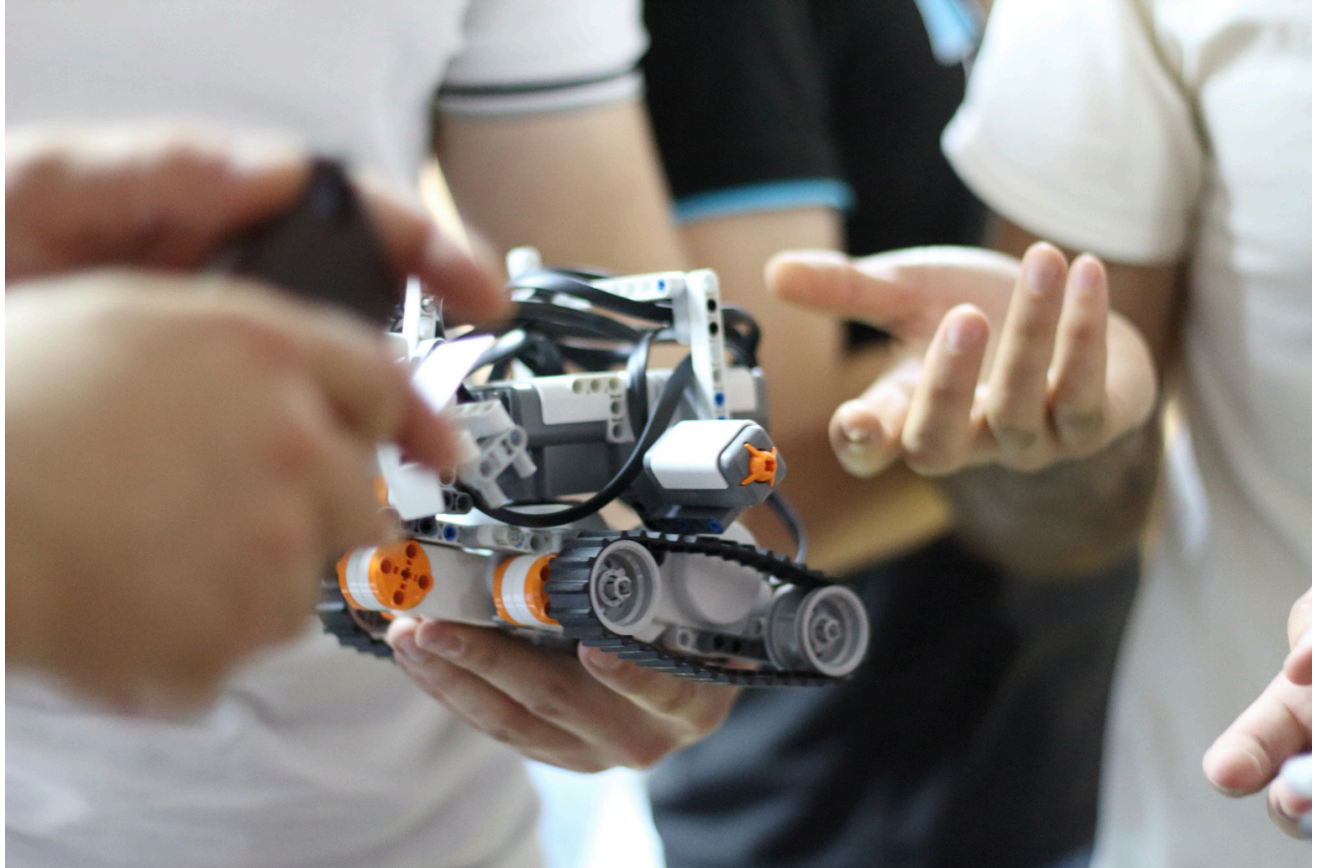


LEGO Technic 4x4 Crawler



Mid-Valley
STEM-CTE HUB



www.midvalleystem.org
midvalleystemctehub@linnbenton.edu
Linn-Benton Community College
Albany Campus - CC-212

LEGO Technic 4x4 Crawler

The LEGO Technic 4x4 Crawler is a motorized, remote-controlled off-road vehicle designed to teach students the mechanics of power transmission, suspension, and four-wheel drive. This advanced set introduces real-world engineering concepts through functional builds with gear trains, servo steering, and articulated suspension systems. Ideal for upper middle and high school learners, this kit supports critical thinking, design iteration, and physical science connections.



Grade Level

7th - 12th

Group Size

2 - 3 students

Time Duration

60 - 120 minutes

Content of Kits

Components

- 1 complete LEGO Technic 9398 4x4 Crawler



Usage

Getting Started

1. **Introduce the Build in Stages** - Break the assembly into logical segments (chassis, suspension, drivetrain, body) to keep students focused and reduce frustration.
2. **Review Key Mechanical Concepts** - Before building, discuss gear ratios, torque vs. speed, and how a differential works to support conceptual understanding.
3. **Explore the Power Functions Components** - Demonstrate how to connect the XL motors, servo motor, battery box, and IR receiver before integrating them into the build.
4. **Assign Roles in Teams** - Use roles like "mechanical lead," "parts manager," and "tester" to support collaboration and time management.
5. **Emphasize Testing and Iteration** - Encourage students to pause and test moving assemblies (like axles and gears) as they build to ensure smooth operation.

Storage

- **Organize by Component Type** - Store beams, axles, gears, pins, and panels in separate labeled bins or compartment trays for fast access and cleanup.
- **Recharge or Replace Batteries Regularly** - Maintain battery health by storing with a partial charge or removing batteries between uses.

Troubleshooting

- **Vehicle Doesn't Respond to Remote** - Check battery levels in both the remote and the battery box. Ensure the IR receiver is in line-of-sight and the channel matches.
- **Gears or Axles Aren't Spinning Smoothly** - Look for misaligned axles, bent beams, or gear teeth skipping—rebuild or adjust tension if needed.
- **Steering Not Functioning Properly** - Test the servo motor separately and confirm it's connected to the correct port on the IR receiver.
- **Motors Seem Underpowered** - Make sure connections are secure and batteries are fresh. Excessive friction from misaligned parts can also reduce performance.



Activity Guide

Beginner

Gear Train Exploration

Before building the full vehicle, students will use Technic beams and gears to construct a series of gear trains. They'll compare rotational speed between input and output and determine how changing gear sizes impacts performance. This foundational activity builds mechanical fluency.

Intermediate

Test the 4x4

Students complete the 9398 build and run a series of test drives over varied surfaces (e.g., ramps, sandpaper, books). They'll observe how the suspension and 4x4 drivetrain adjust to uneven ground, then record performance data to reflect on real-world off-road vehicle design.

Advanced

Customize for Performance

Students redesign one aspect of the 9398—gear ratio, weight balance, or tire grip—to optimize for a chosen goal (e.g., speed, climbing ability, or steering control). They'll test multiple versions and present data-driven conclusions on which changes were most effective.

Extension Activities:

Off-Road Engineering Challenge

Teams are challenged to modify the 9398 to complete a custom obstacle course (e.g., hill climb, figure eight, incline with a payload). They'll iterate on their designs using the engineering design process, then present their approach, adjustments, and performance outcomes to the class.



Learning Extensions

STEAM Connections: Engineering - Design

Learning Objectives:

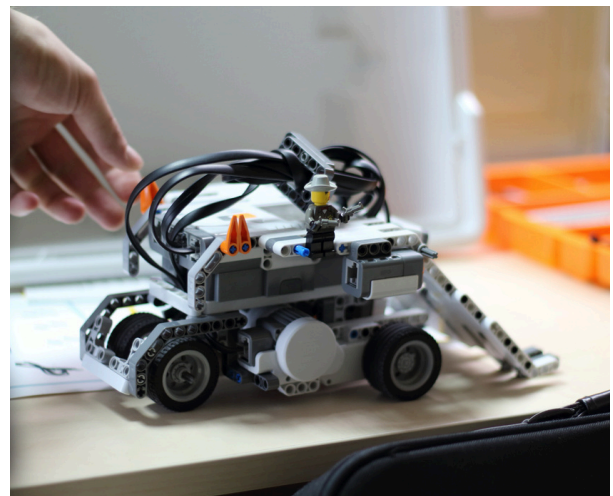
- Understand the mechanics of gear trains, torque, and power transmission in four-wheel drive systems.
- Apply engineering principles to build, test, and optimize remote-controlled vehicles.
- Use data collection and observation to analyze mechanical performance and design effectiveness.
- Collaborate in teams to follow complex instructions and troubleshoot functional issues.
- Engage in iterative design to improve vehicle performance based on specific challenges or criteria.

Career Connections:

- **Mechanical Engineer** – Designs and tests complex moving systems like vehicle drivetrains and suspension.
- **Automotive Designer** – Develops the structure and performance of off-road and high-performance vehicles.
- **Robotics Technician** – Assembles and maintains remote-controlled and autonomous systems.
- **STEM Educator or MakerSpace Leader** – Teaches applied mechanics through engaging, hands-on builds.

Essential Employability Skills:

- Problem-Solving
- Critical Thinking
- Collaboration
- Communication
- Attention to Detail





Resources and Accessibility

Safety Guidelines

- **Check for Loose Parts** – Before running the vehicle, inspect for any loose beams or connectors that could dislodge during movement.
- **Avoid Overheating Motors** – Run the motors in short intervals and allow cool-down time between tests, especially during repeated use.
- **Use Batteries Responsibly** – Remove batteries when not in use and always use fresh or fully charged ones to prevent malfunction.
- **Protect Fingers During Testing** – Keep fingers clear of gears and axles while the motors are running to avoid pinching.

Accessibility

- **Provide Pre-Sorted Parts** – Organize components into labeled trays to reduce cognitive and motor load during the build process.
- **Use Visual Aids or Build Videos** – Supplement printed instructions with enlarged visuals or step-by-step videos for students with visual or processing challenges.
- **Flexible Team Roles** – Assign roles like parts organizer, design strategist, and controller operator to accommodate varied strengths.
- **Offer Extra Time and Build Support** – Allow extended build time or adult support for students who need additional assistance completing complex steps.

Library Catalog



Library Resources



Feedback

QR to feedback survey

