|	**Grade / Age:** Secondary School Students (Grades 9-12 / Ages 14-18) **Topic:** 4Dframe Hands-On Robotics and Mechatronics **Subject area:** Mathematics, Sciences, Arts, Technology **Keywords:** Robotics, Mechatronics, 4Dframe, Design, Programming, Creativity, Innovation, Collaboration, STEAM **Single/team work:** Team Work **Language:** English (can be adapted to other languages) **Duration:** 6-8 weeks

Description of the Task:

 RoboCrafters: Building the Future with 4Dframe Robotics and Mechatronics in STEAM Education
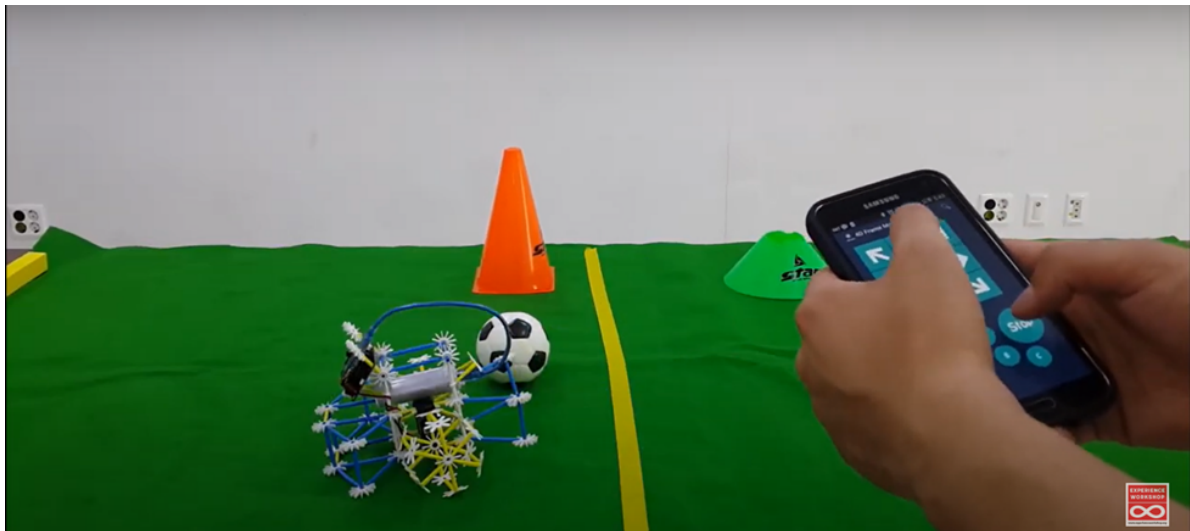
Students will work in teams to design, build, and program a robot using 4Dframe kits to solve a real-world problem or perform a specific task. The project will include the following stages:

Problem Identification: Teams will identify a real-world problem that can be solved or a task that can be performed by a robot.

Design Phase: Students will design their robot, incorporating mechanical, electronic, and artistic elements.

Building Phase: Teams will use 4Dframe kits to build their robot, applying mathematical and scientific principles.

Programming Phase: Students will program their robot to perform the desired task, using logical reasoning and problem-solving.

Testing and Iteration: Teams will test their robots, gather feedback, and make necessary revisions.

Final Presentation: Teams will present their final robot and the process to the class, reflecting on what they learned and how their work connects to mathematics, sciences, arts, and technology.

Objective: Enhance understanding of mechatronics, foster creativity, innovation, critical thinking, spatial awareness, fine motor skills, and collaboration through hands-on robotics activities.

Methodology: Utilization of 4Dframe kits to design, build, and program robots. Iterative process of design, testing, and refinement, mirroring the scientific method.

Tools Used: 4Dframe robotics kits, programming software

Learning Outcomes: Deep understanding of mechanical and electronic principles, programming logic, enhanced spatial awareness, fine motor skills, persistence, problem-solving, communication, and teamwork.

Impact on STEAM Education: 4Dframe hands-on robotics activities serve as a powerful approach in STEAM education, providing tangible, interactive exploration of complex concepts in mechatronics and beyond. Encourages essential soft skills and mirrors the scientific method, offering a comprehensive learning experience that integrates various aspects of STEAM.

Solutions of the Task:
The solution will vary depending on the chosen problem or task. Students will be assessed on their research, design process, collaboration, creativity, final product, and presentation.

Prior knowledge:
Basic understanding of geometry, mechanical principles, introductory experience with programming (training can be provided).

Comments:
This project fosters collaboration, creativity, critical thinking, and problem-solving. It integrates mathematics, sciences, arts, and technology through a hands-on, real-world application. Teachers may need to provide training or resources on 4Dframe kits and programming.

Connection to other subjects/topics/areas:

Mathematics: Application of geometric shapes, spatial reasoning, mathematical calculations.

Sciences: Understanding of mechanical and electronic principles, scientific method.

Arts: Aesthetic design, creativity, visual representation.

Technology: Use of 4Dframe kits, programming logic, technological innovation.

Language Arts: Research, presentation skills, written reflection.

This activity provides a rich, interdisciplinary experience that engages students in a meaningful, real-world project, allowing them to explore the connections between robotics, mechatronics, and STEAM education. It can be adapted to various grade levels and extended to include connections to other subject areas.