

Course Title:	Principles of Applied Robotics and Engineering I
Grade(s):	9-12

Course Description
Principles of Applied Robotics & Engineering I introduces students to foundational engineering, robotics, coding, IoT systems, and mechanical design. Students complete hands-on projects such as robotic prosthetics, environmental monitoring systems, reverse engineering investigations, and a Rube Goldberg machine. Emphasis is placed on the engineering design process, problem-solving, block-based programming, understanding mechanical and electronic systems, and maintaining an accurate engineering notebook.
Approved Curricular Materials/Textbook(s)
mBlock / block-based coding platforms Robotics kits (servo motors, microcontrollers) Sensor kits and IoT modules CAD: Onshape

Unit Title	Unit Description (Include Unit Objectives)	Unit Pacing
Unit 1: Designing Motion: Robotic Prosthetics & Coding Foundations	Students explore how robotics and anatomy intersect by designing and assembling a functional robotic prosthetic hand. They learn coding fundamentals through block-based programming, controlling servo motors, and creating mechanical movement. Students also complete a Reverse Engineering Project, deconstructing a mechanical or electronic device to understand its functional components, design decisions, and engineering principles. Objectives: • Understand basic programming structures (sequencing, loops, conditional statements). • Apply foundational engineering design concepts in prototyping and	5 weeks

	modeling. - Analyze mechanical systems through reverse engineering. - Demonstrate understanding of robotic motion and servo-driven joints. - Apply anatomical knowledge to prosthetic design.	
Unit 2: Smart Systems for Environmental Monitoring & Rube Goldberg Engineering	The unit begins in systems thinking through a Rube Goldberg Machine Project, where students design a multi-step chain reaction machine that integrates sensors, triggers, and environmental monitoring ideas when possible. This blends mechanical engineering, creativity, and automation. Students investigate IoT technologies, sensors, and applications for environmental monitoring. Projects include plant monitoring systems and pest detection. Objectives: - Recognize the role of data in agriscience and environmental monitoring. - Use sensors to collect and interpret environmental data. - Apply IoT principles to environmental systems. - Demonstrate systems engineering through multi-step automated designs. - Program sensors for pH, moisture, temperature, and light. - Visualize and interpret data trends. - Design a multi-step chain-reaction system. - Integrate mechanical, electrical, or sensor-based components. - Document each transfer of energy or action. - Troubleshoot timing, motion, and reliability. - Present final systems with an explanation of engineering choices.	6 weeks
Unit 3: Building Intelligence: Robotics, CAD, & Manufacturing	Students build introductory robotics systems, including a small rover, develop CAD skills for part design, and learn basic manufacturing concepts using CNC routers and laser cutting technology. Students print custom-designed components and assemble functional robotic builds. Objectives: Use CAD tools to create and modify 3D models.	7 weeks

	• Operate 3D printers safely with proper tolerances. • Assemble a rover with motorized wheels and drivetrain optimization. • Apply principles of automation and mechanical power transmission. • Interpret engineering drawings and maintain documentation. • Create parts using a CNC and laser cutter.	
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