

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

Course Description
Principles of Applied Robotics & Engineering II builds on the foundational skills from PARE I and moves into advanced robotics, aerodynamics, drone systems, robotic arm programming, CAD-driven manufacturing, and sustainable engineering. Students complete hands-on projects such as wing design and quadcopter assembly, robotic arm programming, and sustainability-focused innovation work.
Approved Curricular Materials/Textbook(s)
CAD: Onshape Teacher-curated engineering materials

Unit Title	Unit Description (Include Unit Objectives)	Unit Pacing
Unit 1: Lift Off: Aerodynamics, Wind Tunnel Testing, RC Planes, & Drones	Students explore the physics of flight and aerodynamics through wind tunnel experiments, RC plane construction, and quadcopter drone assembly. Students learn how airfoil shape, materials, and weight distribution affect stability and lift. Objectives: • Explain aerodynamic principles including lift, drag, thrust, and airfoil design. • Test and analyze wing shapes using iterative designs. • Evaluate control surfaces. • Build and calibrate drones. • Operate drones safely following proper protocols.	5 weeks
Unit 2: Building	Students expand their robotics and CAD skills by designing custom components,	6 weeks

Intelligence: Robotics, CAD, & Manufacturing	assembling robotic arms with multiple degrees of freedom, and programming controlled movements. They apply troubleshooting techniques to refine performance. Objectives: • Create advanced CAD components for robotic systems. • Print and evaluate custom mechanical parts with 3D printers. • Create parts using laser cutting technology. • Assemble a robotic arm integrating motors and sensors. • Program robotic movements using loops and logic. • Troubleshoot mechanical and software issues in robotic systems.	
Unit 3: Sustainable Solutions: Energy, Life Cycles, & Recycling Engineering	Students evaluate environmental challenges and design engineering solutions related to renewable energy, recycling systems, and product life cycles. Projects include wind turbine performance testing and sustainability improvement proposals. Objectives: • Analyze the life cycle of a product and identify environmental impacts. • Design and test wind turbine blades for improved energy output. • Research effective recycling methods and model an improved system. • Collect and interpret efficiency and performance data. • Apply engineering design thinking to sustainability challenges.	6 weeks